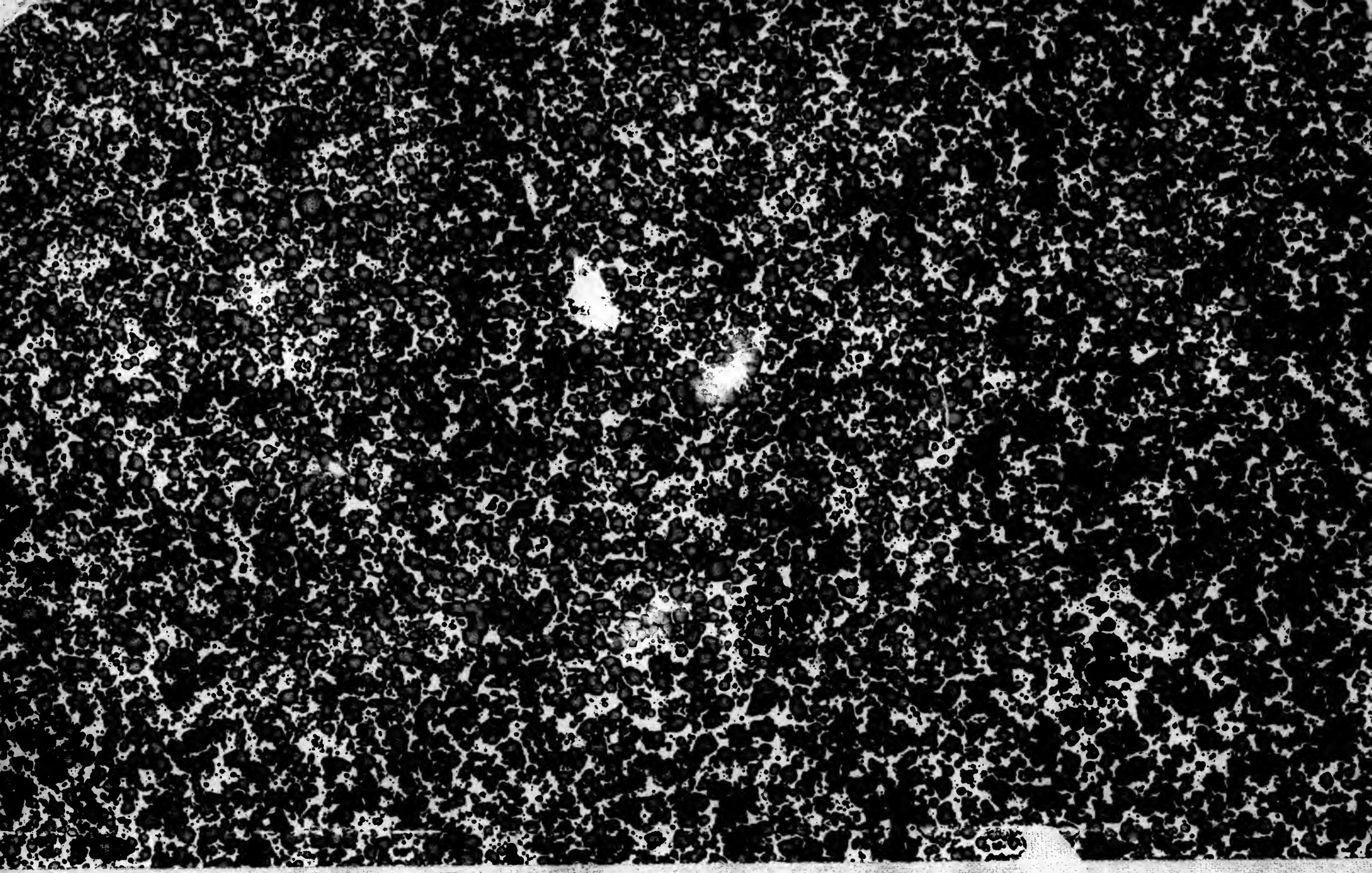
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THE NEW VOLUME.

WITH this issue begins Volume 58 of a periodical the establishment of which was almost contemporary with the introduction of the locomotive into the United States. Readers have a greater or less acquaintance with the condition of incipient railroad development in this country at the end of 1831 and the beginning of 1832, from their perusal of the series of articles reviewing early numbers of the JOURNAL, now being published in its columns. A comparison between then and now, however general, strikes the mind with admiration at the astonishing growth of the railroad interest in this country and in the civilized world elsewhere, within sixty years. No parallel to this astonishing progress in the use of any one invention can be found in the pages of industrial history. In the diversity of its utility and its wonderful results, the mere mention of which would exhaust the space appropriated to this article, the locomotive is the greatest of all inventions; and no country, perhaps, has profited by it more than the United States. To the railroad must be attributed, for instance, that expansion of agricultural industry which is the foundation of the national wealth.

The JOURNAL for more than half a century has given periodically the details of railroad progress in the United States, during the greater part of this long period by weekly publication. One year ago the proprietors determined upon a change which has been found advantageous, namely, its appearance at monthly instead of weekly intervals. The change has been found to be an improvement, the view of a month's business being more generally acceptable to readers than that of a week's. We are looking forward to a year of greater success than even that of the past, under the continuance of the system of publication once a month only.

The appearance of the Index to the volume completed last month, is unavoidably delayed. It will be ready in time to accompany the May number. Subscribers may rely upon this promise. We regret exceedingly their present disappointment in the matter of the Index to the last volume; and respectfully suggest that they postpone having its numbers bound until after the publication of the May issue, which will certainly be supplemented by a carefully-compiled Index of Volume 57.

Arrangements have been made for the publication in the next and following issues, of articles on practical railroad subjects by pens well qualified for the task. The number of these articles and their subjects will be determined very much by the indications reaching us through the mails.

And this leads us to say, as our final paragraph on the present occasion, that we cordially invite contributions for publication under the head "Communications." All who have anything to say of interest in connection with railroad matters are reminded that the AMERICAN RAIL-

ROAD JOURNAL is ready still to give their utterances circulation. If every reader will coöperate with the editor and publishers, the volume of the JOURNAL opening with the present issue, can easily be made the best in its long history.

PRESIDENTIAL.

WE are daily reminded that this is the presidential year. In the first place, the daily papers are full of politics, and many of them are discussing the merits and demerits of some possible candidate for that high office. We are again made aware of the peculiar character of the year by the interest taken in local elections by the different parties, each party being as anxious as possible to control the majority of wires, no matter how insignificant some of them may be. Business men bring the fact to our attention by daily growling about the poor business they are doing, and oracularly stating that it is ever thus in the presidential year. Those who have charge of our churches are not slow in uttering their complaints about non-attendance at prayer meetings, and blame the presidential year for their small congregations.

Now to the political writer of this Journal these complaints seem alike nonsensical. The daily papers have a perfect right to discuss the merits and demerits of any man seeking office just the same as they have to discuss the efficiency and inefficiency of our navy. Public men, like ships of war, arsenals, forts, etc., are public property, and the people must be informed what kind of property they are investing in when solicited for their suffrages. The daily press has this task to perform, and if any presidential candidate objects to having his short-comings exposed, let him withdraw from the contest.

In regard to the politics discussed by the daily press, we have a few words to say. There are certain issues that are settled, and there are others that are dead. It is a waste of ink and paper to talk about Abolitionism, for this issue was settled years ago. Whether right or wrong, slavery has been abolished in this country and that is the end of it.

Aboriginism is way behind the times, for there are so few Aborigines that any school boy having mastered the addition table can count them without trouble. The few remaining descendants of the original tribes can be as well taken care of by one party as the other.

The questions of Union and Disunion have had their day, and have been settled by the flowing of as many million ounces of blood as millions of dollars out of the pockets of those who engaged in settling the contest. The intelligent traveler who goes South as well as North beholds no more solid South or solid North. He beholds only the United States of America. Concession and Secession, Destruction and Reconstruction are questions that have been laid to rest in the graves of the men who waxed eloquent advocating them. In this piping time of peace, one may well ask what are the issues of the hour, and young men must give answer. Old men are too full of the past to be alive to the needs of the present, and the young men must dictate what they need, and not take what the old men have to offer.

Among the foremost issues of the day are the tariff question, the banking system, the currency question, and some few others we need not mention.

The tariff question is one of such vital importance to all classes of society, on account of this country being able to produce so much more than it can consume, that the party which first gains an intelligent conception of it, will be the best entitled to the confidence of our citizens. We leave this issue here as we hope to treat of it in a subsequent number. The banking and currency questions will be discussed in an editorial under the heading of Bullion in our next number.

In regard to the possible candidates now being discussed, we have nothing to say. We have lived long enough to see the machinery of this government move right along, with the martyred LINCOLN being borne to his grave. We have seen his successor stand a trial when the effort was made to impeach him. We have seen the government almost without a responsible head during GARFIELD'S long struggle between life and death. We have seen men occupying the presidential chair, to whom no smart business man would give a thousand dollars a year for his services as a clerk in his business. In fact, going over the list of men who have been elected to this high office, the firm belief has taken hold of us that the majority were third-rate men. One thing alone is certain, and that is, that on the 4th day of March some one will be at the door of the White House, ready to take the oath, and whether he be first-rate or third-rate, the machinery of the government will move right along, because it is a government controlled by the governed.

In regard to the presidential year interfering with business, we are disposed to question the accuracy of the statement, for this year at least. There are too many other good and sufficient reasons for the dull aspect of the present and the outlook for the future. The great middling class to which tradesmen look for business, is rapidly dwindling away, a few going over to the ranks of the wealthy, but the great majority swelling the ranks of the poor. Some thinkers are of the opinion that the tariff has much to do with this condition. Of one thing we are assured, that times have changed since we were boys, when brains and energy could carve a way to fortune. It takes capital to do this now. With the whole world for a market in which to buy and sell, we might renew the middling class, and make it possible for a man with a little capital to succeed, and thus in making customers increase the volume and profits of business. The complaint of ministers and religious people that the presidential year depletes the attendance at their churches, is the veriest bosh imaginable. Men are like animals, and will go to the crib where they can find the food they need. When a man's mind is filled with enthusiasm for the welfare of his country, he don't care to hear about the lost tribes of the house of Israel. It makes no difference to him whether the whale swallowed Jonah or Jonah the whale. What he wants is to be instructed as to the needs of the people, and his duties as a God-fearing, man-loving citizen.

It is no use for any of us to blame the presidential year for the losses, calamities, or sorrows that come to us. They have all come in other than presidential years, and will come any year when circumstances, time and place conspire to induce them.

The presidential year teaches but one great lesson and that is, that every man is expected to do the best he can for the welfare and prosperity of his country.

The Late Augustus Schell.

At a special meeting of the boards of directors of the New York Central and Hudson River Railroad Company; the Lake Shore and Michigan Southern Railway Company; the Michigan Central Railway Company, and the New York and Harlem Railroad Company, jointly assembled at the Grand Central Depot, on the 28th day of March, 1884, the death of the Hon. Augustus Schell was announced as having occurred on the previous day, whereupon it was resolved that the following minutes be entered at length upon the records of each corporation:

Augustus Schell, who died in New York city the 27th inst., was born at Rhinebeck, Dutchess county, August 1, 1812. He was graduated with high honors from Union College, and adopted the profession of the law. An able and upright counsel, he soon entered upon a large and successful practice. Always deeply interested in public affairs, he has been for forty years one of the controlling minds of his party and in positions of great power, responsibility and trust. By wise and patriotic administration he strengthened the confidence of his friends, and received the official approval of his political enemies. Modest and unobtrusive in his charities, his election as trustee and president of many of our most beneficent institutions, and his continuance in such trusts for over a third of a century, are enduring testimonials to the benevolent work of his life. In 1862 Mr. Schell entered upon his railway career, as a director of the Harlem Railroad Company. The railway development of the country was then comparatively in its infancy, but he foresaw the future and embarked his fortune in and gave his time and mind to these great enterprises. In the most important part of this work during these eventful twenty-five years he has been an important factor. His clear judgment, unswerving fidelity and ever hopeful temper were the help and reliance of his associates during the whole of this long period. He possessed in the highest degree those rare qualities of common sense and unerring discernment which made him invaluable as an adviser, and makes his loss irreparable. His firmness and fixedness of purpose in sustaining his principles in prosperity and adversity, in prosecuting what his judgment approved, regardless of defeats or discouragements, were only equalled by his devotion to his friends. As directors we lament the death of one whose mind and integrity peculiarly fitted him to be the manager and custodian of great interests. Years of association and intimacy deepened our respect and increased our friendship for him, and each of us in his own way was bound to him by a thousand tender ties.

Mrs. Schell and the family have in this sad bereavement our profoundest sympathy.

"Resolved, That a copy of this record be sent to Mrs. Schell."

E. D. WORSTER, Secretary.

SEVEN cardinal virtues should be found in a pen. It must be elastic, well tempered, durable, even-pointed, easy writing, well shaped and neatly finished. Esterbrook's have all these qualities in perfection.

THE Burton Stock Car Co., of Boston, have just shipped two of their cars to Sydney, N. S. W., for the Australian government.

AT the first meeting of the Board of Directors of the consolidated company known as the Chicago, St. Louis and Pittsburgh Railroad Company, held in Philadelphia, on April 3, 1884, the following officers were elected: G. B. Roberts, president; J. N. McCullough, first vice-president; William Thaw, second vice-president; Thomas D. Messler, third vice-president and comptroller; John W. Renner, assistant comptroller; J. T. Brooks, general counsel; J. J. Brooks, assistant counsel; John E. Davidson, treasurer; M. C. Spencer, assistant treasurer; S. B. Liggett, secretary; A. A. Stull, assistant secretary; James McCrea, manager; John F. Miller, superintendent eastern division; Charles Watts, superintendent western division; M. J. Becker, chief engineer; E. B. Wall, superintendent of motive power; S. H. Church, superintendent of transportation; William Mullins, purchasing agent; Albert McElevey, auditor; John C. Snee, paymaster; William Stewart, general freight agent; F. H. Kingsbury, assistant general freight agent; D. T. McCabe, general western and division freight agent; E. A. Ford, general passenger and ticket agent; Charles O. Scull, chief assistant general passenger agent.

THE actual gross earnings of the Denver and Rio Grande Railway and its leased lines for February, were $391,780.54, and the operating expenses $357,212.16, leaving net earnings of $34,568.38. The loss on operating the Denver and Rio Grande Western Railway, being shut out of Silverton and Durango by snow slides, and the Colorado Coal and Iron troubles, largely reduced net earnings for the month. The business is still to be done, and will show in later months. April, so far, is ahead of same time last year.

THE Atchison, Topeka and Santa Fé Railroad Company officially announced on March 1, that Judge George W. McCrary has beeen appointed to the office of general counsel. A. A. Robinson, the general superintendent, is promoted to be general manager, and G. B. Harris is appointed assistant general manager.

R. M. PATTERSON, superintendent of the Rochester Division of the New York and Philadelphia Railway, has resigned. The Rochester Division and the narrow gauge system of connections have been consolidated, and J. W. Watson has been appointed superintendent, with headquarters at Olean.

ON April 1, John Dougherty was appointed treasurer of the Buffalo, New York and Philadelphia Railroad Co., vice F. S. Buell, resigned. On same date F. S. Buell was appointed cashier of the company, with office at 43 Exchange street, Buffalo.

THE Delaware, Lackawanna and Western Railroad has recently made the following appointments: B. A. Hegeman, traffic manager; William S. Sloan, general freight agent; W. F. Holwill, general passenger agent.

HOWARD E. LAING, formerly general agent of the passenger department of the Wabash Railway, has been appointed special agent of the passenger department of the Chicago and Alton Railway.

The other officers and employés of the Chicago, St. Louis and Pittsburgh Railroad Company, of Indiana, were continued in their respective positions until further orders.

ROSWELL MILLER has been appointed assistant general manager of the Chicago, Milwaukee and St. Paul Railway.

RAILROAD MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,
SECRETARY BOARD OF HEALTH, STATE OF LOUISIANA.

BRITISH INDIA.

THROUGH the courtesy of the United States Consul-General at Calcutta, Hon. H. Mattson, I have been furnished with some particulars from the office of the Director-General of Indian Railways, relative to their medical service. It appears that these railways are owned, or at least controlled, by the government, inasmuch as they all have surgeons, most of whom are supplied from the Indian service, each drawing the pay of his class and grade. When practicable, the services of local government surgeons are made available, and they sometimes receive extra remuneration, besides pay of their grade. Large lines have special surgeons, assisted by apothecaries, assigned to the medical service.

Employés receive medical attention in ordinary sickness as well as in case of accidental injury; and no exception is made when the illness grows out of indulgence in vice. Under special arrangements, the families of employés also receive medical attention, but particulars touching the conditions and mode of administration have not been furnished.

Employés are not required to contribute to the maintenance of this service, by deduction from their wages or otherwise.

Where convenient, local hospitals are made available for this railway medical service; and in some instances special hospitals have been provided by the railway authorities.

There is no provision of instruments and surgical appliances, to be kept at stations or carried on trains.

All classes of employés are subjected to physical examination, previous to engagement, the examination being adapted to the kind of duty required.

The personal hygiene of employés and the sanitary condition of railway carriages, buildings, grounds, etc., are under supervision of the medical staff.

The families of employés, in case of injury, sickness or death, sometimes receive relief from the government in the shape of gratuities. Further relief may be obtained from provident asssociations, sustained by the voluntary contributions of members.

It does not appear that there are any general regulations relative to transportation of live stock, to prevent over-crowding, deprivation of food and water, too long confinement, or admission of diseased animals; but "precautions are taken in special cases."

AUSTRALIA.

My information respecting the medical service of the railways in the colony of Victoria has been obtained through the kindness of our Consul-General at Melbourne, Hon. O. M. Spencer, who put himself in communication with the Secretary of the Railway Department of the government, Hon. P. R. Labertouche.

This officer states: "Formerly such service was performed by the chief medical officer of the Victorian government. About two years ago this course was abandoned, and tenders were invited from duly qualified practitioners for this service, and the tender accepted provided for the examination of candidates for permanent employment in the railway department before appointment, for which they pay a fee of half a guinea. This examination comprises the physical development of the candidate, his general state of health, and a special examination to discover color-blindness. Besides these services, the medical officer examines employés whose state of health may be considered to unfit them to perform their ordinary duties. In such cases the fee is £1 1*s*, which is paid by the department, if the examination is at its instance, and by the employé, if at his.

"A special allowance of £60 per annum is made to another medical man for attending, in case of accident, to the men employed in the locomotive workshops of the department, who number about 700."

Neither employés nor their families receive medical attendance in ordinary sickness; but in case of injury sustained while in the discharge of duty, employés are allowed half pay while disabled. An employé is also entitled to a retiring allowance, which in case of death is paid to his family.

No special railroad hospitals have been established. Civil hospitals admit railway employés under their general regulations, without any special arrangement.

All classes of employés are subjected to physical examination, according to the kind of duty they perform, before engagement.

There is no sanitary supervision of employés or of railroad carriages, buildings, grounds, etc. As no railroad route is more than 200 miles in length, it is not thought necessary to establish any regulations for the transportation of live stock.

I have been supplied with a copy of the Rules of the Victorian Railways Annual Mutual Benefit Society, which was established in 1866, and in which membership is voluntary. No one is admitted who is in bad health, or in any way unfit for duty at the time of application, or who is over 45 years of age. Contributions are at the rate of 2s. 6d. per month. The entrance fee is 7s. 6d. to those under 40 years of age, and £1 to those older. Additional levies may be made to meet deficiencies. Neglect to pay dues for three months involves suspension or deprivation of benefits, at the discretion of the committee; and when the arrears amount to 15s., the member is finally dropped.

No member is entitled to sick allowance or funeral benefits until after six months' membership; but he may reclaim his contributions on leaving the department before that period has elapsed. Every application for relief must be accompanied by a medical certificate attesting to the sickness. In case of death, a certificate to that effect must be furnished. A member who has become sick, lame, blind or infirm, and thereby incapable of following his usual occupation, provided the disability be not due to drunkenness or other vice, and after approval by the committee, is entitled to 20s. per week for the first twenty-six weeks, 15s. for the next twenty-six weeks, and 10s. per week thereafter. But no member can receive more than twenty-six weeks' full benefit the same year, and must have an interval of six months before he can claim allowance for a fresh case of sickness.

On the death of a member in good standing, his next of kin or his representative is entitled to an allowance of £20. On the death of a member's wife, the husband is entitled to £10. A member's widow may continue a member of the society while unmarried, provided she sus-

tain a good character, and complies in all respects with the regulations. On her death, the sum of £10 is allowed to her legal representatives.

In 1878 additional regulations were adopted for the benefit of aged and infirm members, and also those disabled by accident or by a permanent disease. Members retiring from service above the age of 60 years, or physically disabled in the line of duty, are placed on this list, and are entitled to an allowance of 5s. per week after membership not less than five years, or 8s. after 10 years' membership, or 12s. after 15 years' membership; and 6d. per week for every additional year of membership above the periods stated. At the same time their contributions cease.

The United States Consul at Sydney, New South Wales, Charles Kahlo, Esq., has kindly furnished me with information relative to the medical service on the railways in that colony, which he obtained from the Railway Branch of the Department of Public Works, through its secretary, D. Vernon, Esq.

The government railways of the colony have a medical board of three members, two of whom reside at Sydney and the other at Newcastle or Maitland, who are paid regular salaries, besides fees for certain services. The duties of the board are: to examine applicants for employment with reference to their general health, and especially their eyesight for long distances and perception of colors, and their perfection of hearing; to examine employés who apply for sick leave, and those individuals who have received injuries from railway accidents; to attend such sufferers from accidents as may be indicated by the Commissioner of Railways; and also to prepare such reports, certificates, etc., as may be required. The services of local medical practitioners are occasionally called in requisition in case of emergency.

Apart from injuries sustained in discharge of duty, employés receive no medical attention from the railway authorities. Arrangemements, however, have been made for medical chests, suitably supplied with drugs, instruments, etc., to be carried on all passenger trains, and to be kept at the principal stations. Printed directions have also been issued to the men for treatment of injuries, in the shape of a neat leather-bound pocket-book.

Some attention is paid to the personal hygiene of employés and the sanitary condition of railway carriages, buildings, grounds, etc., probably by the medical board.

Provision is made by the railway department for employés killed or injured, but particulars have not been furnished.

Owners of live stock are presumed, in their own interest, not to overload the cars provided for their use. Australian cattle are said to be so wild that they will neither eat nor drink while *en route*.

The printed Rules of the Railway Traffic Branch Sick and Accident Society, established in 1871, are very similar to those of the society mentioned above, as existing among the employés of the Victorian railways. No provision is made in the latter for a retiring allowance to those disabled by age or infirmities.

This concludes what I have to say of the railroad medical service existing in foreign countries. Some materials have been gathered relative to the railroads of the United States, which may take like shape in future issues of this JOURNAL.

Permanent Way for High Velocities.

BY WM. S. HUNTINGTON.

THE American people are difficult to please. When they are satisfied that their desires in any particular direction have been gratified as far as lies within the range of possibilities, they are comparatively contented and happy; but if they have a suspicion that they have not reached the full extent of what is possible for them to enjoy, they are at once uneasy and fretful. Thus, when railroading was in its infancy and cars were drawn by horses of flesh and blood, ten miles an hour was satisfactory in the main, but when fifteen miles was "done" in an hour, there was nothing further to be desired. So far as travel was concerned, we had reached beyond all expectations, and we were happy and contented because we did not believe it possible to increase that rate of speed. Everything was serene until the "iron horse" was trotted out and made twenty miles an hour. Then twenty-five, and finally thirty miles an hour was done! But the American people were no longer satisfied. Fifteen miles an hour was highly satisfactory in the start, but when that speed had been doubled and in many instances more than doubled, the cry was, still faster, and we now complain that sixty miles is too short a distance on which to waste an hour. The public understand that we have not yet reached the utmost limit of possibilities as regards the speed of railroad trains, and they are restless under the restraint which is brought upon them while waiting a short time for that development or improvement of permanent way and motive power which is necessary for running trains at the velocities now demanded by a fast people in a fast age.

More than ten years ago the writer of this article made the statement that it was his belief that the locomotive of that period was substantially the same as would be in use many years hence; that no startling change would be made in the form and general construction of the machine, but that minor improvements would be added to it from time to time, and would keep pace with the growing demands for higher speed. And it was confidently predicted that any speed an exacting public might demand up to 100 miles an hour, would be accomplished at no distant day. This prediction—which was thought by many to be rather wild—was based on the fact that at that time there was a marked improvement in track and locomotives; and the performances of the latter on some of our best tracks pointed to 100 miles an hour as among the possibilities, if such a velocity were required.

When we set our stake at 100 miles an hour it did seem a great way off, but we are nearing it at a lively pace. When the mark was made, forty-five miles an hour was considered lively work, and that was reached only on extra occasions. We have gradually neared the 100 mile post, until we have (on an extra occasion) made ninety-one miles in sixty minutes. We expect within the next ten years to add the other nine miles to our present record, which should be sufficient to satisfy the fastest American alive. And we shall do it with the *American locomotive*. No *monstrosity* need apply.

But this article has little to do with locomotives, further than to say that in reaching the 100 mile post the locomotive men are gaining on those who prepare the way for fast travel. When we get our tracks as near perfection as

our best locomotives have reached, the most *unreasonably fast portion* of our people can be handled at the speed of 100 miles an hour, if they will pay for it.

As there seems to be an increasing demand for fast trains, it behooves all who have charge of construction and repairs of track to "look alive," as our English cousins say, and get prepared for any speed that may be called for up to 100 miles an hour. Beyond this we shall not go.

The first thing to be done in the premises is to cut down the hills and fill up the hollows and prepare a road bed, and grade with special reference to fast work. This done, it remains to build a superstructure capable of withstanding the rough usage it would be subjected to under heavy trains at high velocities. This would require an abundance of heavy cross-ties, supported by a liberal quantity of good ballast, and the latter should be so applied as to support the ties laterally as well as vertically. One of the principal causes of "bad track" on American railroads, is the lack of ballast at and outside the ends of the ties. Without sufficient ties and ballast the track is very unstable, and although it might behave satisfactorily under light traffic and low rates of speed, it is entirely unfit for fast or heavy work. It may be kept in tolerable surface with a great deal of care and labor, but ballast is cheaper and safer than labor. Some years ago engineers sought to strengthen rails vertically by increasing their height without any addition to their weight. In this change of pattern they were successful to a certain extent; but while they improved the rail in one direction they injured it in another, and although the rail of new pattern was capable of sustaining a greater weight, it could not withstand lateral strains, and soon become full of kinks under the rough treatment of the "moguls." In designing a rail for heavy trains and high velocities, lateral stiffness should be kept in view as well as vertical strength. Width of base is also of greater importance than has usually been attached to this matter. By increasing the width of base the rail is strengthened laterally, is less destructive to ties, and will the better resist end thrusts of axles, and tendency to roll outward from lateral pressure. The coming rail will undoubtedly have a very broad base.

It is not expected that the speed we are looking for will be made on curves of very short radius, although curves are less dangerous with fast trains than is generally supposed. A train is less liable to derailment on curves in good condition than on tangents, and if it were not for the greater liability of collisions and encountering land slides, rocks and other obstructions, and all that class of accidents resulting from an obstructed vision, curves would be the safest parts of the road. But for fast work *compound curves* are bad. When a locomotive enters a curve with uniform radius and elevation it moves with a steady, *graceful* and gliding motion that is altogether pleasing, but getting quickly around a compound curve is decidedly awkward, and more than a trifle dangerous. Locomotives weighing fifty or sixty tons are being prepared to do the fast work of the near future, and it is unsafe to trifle with their centrifugal force by "breaking it up" on compound curves. Better not have such curves.

The frequent accidents from spreading of rails with our comparatively low rates of speed, would indicate that in preparing for quick trains some effective measures must be adopted to prevent this displacement of rails, which will become more frequent with heavier trains and higher velocities unless some specific remedy is employed. It is evident that the ordinary spikes are inadequate alone, and rail braces must be brought to their assistance to prevent this most needless class of accidents. For the coming heavy and fast trains, straight lines as well as curves must be braced to prevent the spreading of rails, and if this and other details mentioned herein are properly attended to, we can increase our speed and at the same time diminish the number of unexplained derailments. Bridges need a liberal share of the attention that must be given to the preparation of permanent way, in order to render them equal to what will be expected of them. The most disastrous failures of these structures of late, have resulted from the reluctance of ambitious engineers to disfigure their graceful spider-web specimens of engineering skill with lateral stays, on very high and very narrow bridges. And it will be necessary to look up the best safety switch in existence and use it; likewise the best system of signals. Brakes are daily becoming of greater importance than heretofore, and prejudice or lucre should not stand in the way of getting the best. The task of putting tracks in a condition to carry trains at the speed indicated is not a difficult one, but those who have the work in hand will do well not to lose sight of the foregoing brief hints.

To Make Trucks Square Economically.

IN a speech at the last convention of the Master Car-Builders' Association, W. R. Davenport, Erie Car Works, said: "I knew of an instance of a train which came in and reported four hours late. The train was of moderate size, and the conductor said he did not know what the matter was, but the train pulled very hard. The connecting rod had the same difficulty until they cut out the first lot of five cars without doing any good, but when they cut out the second five cars there was no longer any difficulty in pulling. Evidently the second time they cut out the car that gave the trouble. We set about devising a plan to make trucks square economically. We first saw that everything was perfectly square. We drilled taper holes and fitted taper steel pins to the holes, and had castings prepared that would fit the curvative and flange of the wheel, so as to hold the wheel firmly in exactly the same position; rolling in the first pair of wheels and setting them up against these castings, rolling in the second pair and bringing them up and matching the flanges of the first pair, so that they occupied precisely the same position on the rail, and setting up a second pair of castings corresponding to the first. We had the two pairs of wheels set in the same position to each other on the rail, squared up and wedged there securely. We found the men were able to set up the trucks very rapidly. They really made a gain in the construction of trucks fully equal to the time required in adjusting the wheels on the track. The result has been very satisfactory. All practical car builders who have seen it are pleased with it, and say they wonder they did not think of it before. It is a very simple thing. There is no patent on it. Anybody can use it, and I think it will be found to be very beneficial in the construciton of trucks.

A RETROSPECT:

BEING

Complete History of Railroad Progress in America.

Compiled from this Journal, beginning Fifty-two years ago.

CHAPTER IV.

THE HARLEM RAILROAD "LOCATED"—DIRECTORS OF THE PROVIDENCE AND BOSTON RAILROAD COMPANY, FOR 1832—RAILROAD PROPOSED, IN 1831, TO BEGIN AT CHICAGO—VIRGINIA'S ATTITUDE TOWARDS RAILROADS IN 1831, AND PROPOSED IMPROVEMENT OF THE JAMES RIVER.

ON January 14, 1832, the JOURNAL reported the "location" of the Harlaem Railroad, which had been laid out by the corporation of the city of New York. The road was to begin at Twenty-third street, "and pass through the center of the 4th, or Broadway avenue, to Harlaem River, at a point about 300 yards above the bridge." The length of the route selected was five miles. Operations were to begin by the first day of the next month, the date when all contracts were appointed to be made. "It is intended," says the writer to whom we are indebted for these facts, "that this road shall be constructed in the most permanent manner, with double track, and the cost to be about $50,000 per mile. Application will be made to the Legislature at its present session, for permission to continue the railroad down to Fourteenth street, and to such other part of the city as the Corporation may permit. There is little doubt but this will prove a profitable investment to the stockholders, even if no other use should be made of it than for passengers." The concluding sentence of the article embodying so much entertaining local history, is especially noteworthy: "It is however so located as to meet the road now in contemplation from Albany to New York, on the east side of the Hudson River."

On the eleventh of January, 1832, the following gentlemen were chosen directors of the Providence and Boston Railroad Company, at a meeting held in Boston: Wm. W. Woolsey, of New York; Thos. B. Wales, J. W. Revvu, P. T. Jackson, and J. F. Loring, of Boston.

The shrinking modesty of Chicagoans will receive no shock from the fact that their now world-famed city had early mention in the history of the American railroad system. In the *Illinois Intelligencer*, of December 24, 1831, appeared a communication from J. M. Bucklin, engineer of the Michigan and Illinois Canal, addressed from Springfield, November 21, 1831, to Charles Dunn, acting commissioner of said canal. Mr. Bucklin says: "Having (in conformity with your instructions) finished the examination of the Calimic river, together with a series of surveys in the valleys of the Des Plaines and Illinois rivers, necessary to the development of their true character, with reference to the projected improvement of the communication between Lake Michigan and the navigable waters of the Illinois river, by means of a canal or railway—a detailed report of the result, including the maps and profiles of the different lines surveyed, will be furnished the Board as soon as practicable. The objects of the examination of the Calimic river were in a great measure attained. But with every facility afforded for the supply of the summit level with water, at the most favorable elevation, the facts elicited by the examination of the route of the proposed canal, are unfavorable to the practicability of its safe and economical construction. The route examined for a railway commencing at Chicago, crossing the Des Plaines at Laughton's ford, and pursuing the N. W. bank of the Des Plaines, was found extremely favorable for the adoption of that species of improvement. The ascent from Chicago to the summit level, is twenty-five feet, and the descent from thence to the foot of the Rapids of the Illinois, 170 feet; which can be readily overcome by locomotive power, without the aid of stationary engines, at a rate of graduation rarely attaining, and seldom exceeding, twenty feet to a mile. Materials of stone and timber are generally found in the immediate vicinity of the line." Thus the surpassing eligibility of Chicago as a railroad station was early ascertained and officially reported by an expert in surveying.

A little good-natured banter at the expense of the State of Virginia, shows what a sprightly man the first editor of the AMERICAN RAILROAD JOURNAL was. "The Old Dominion," he says, "has strong predilections for old ways. To such an extent, indeed, does it carry this predilection, that it is almost proverbial for bad roads; which, because they were good enough for the fathers, are now thought good enough for the sons; and, for being somewhat behindhand in the improvements which other states have accomplished or are rushing into. The improvement, however, above Richmond, of the James River—a main artery of Virginia—is now seriously contemplated, and, according to extracts we find in the Richmond *Whig* from the Chief Engineer's report, it is by a railroad that this improvement is to be effected." The report of Captain Crozet, the chief engineer referred to, is an exceedingly interesting document. It seems that the estimated amount of the capability of the commerce of the James River, between Richmond and Lynchburg, at the date December 26, 1831, was: $54,887, canal; $168,020.40, locks and dams; and $78,892, railroad. "These receipts," writes Captain Crozet, "are the surplus to be deposited in the Treasury free from all the annual charges of the improvement of the section up to Lynchburg." Having reviewed the three modes of improvement feasible between Richmond and Lynchburg, namely, locks and dams, a canal, and a railroad, he proceeds to give unhesitatingly his preference for the last-named, and backs it with substantial reasons. The mere question of economy, he admits, would determine the choice in favor of a lock and dam improvement; "but if it is wished to adopt, at once, that style of improvement best adapted to secure to Virginia the great and extensive advantages she can command by her geographical situation, a railroad is undoubtedly the system I should prefer. This opinion," he continues, "to which I have inclined for some time, has been fortified in my mind by the operations of the past seasons, which have proved the connection with the West to be most remarkably practicable; and if Virginia is prepared to expend three millions of dollars upon an improvement up to the mountains, it is certainly not to a canal I should wish to see them applied." He founds his

preference for a railroad upon the consideration of its cost, which "(double track) would not exceed $20,000 a mile, as is now fully established by the experience of the Baltimore and Ohio Railroad;" upon the increased travel which would result from its construction; and its (the railroad's) providing uniformity in the mode of transportation. This last, he regards as "the principal and most decisive consideration," because "it saves the expense and other inconveniences of translation everywhere, and in this particular instance may save the whole trade; for, if now the trade of Tennessee goes to Baltimore, over the worst of roads, how much more readily would it take that course, if a railroad from Tennessee or Kanawha, to James River, was met there by one coming along the valley of the Shenandoah?" A tidbit of rhetoric follows, which the compiler cannot resist the temptation to quote: "Let us picture to ourselves a train coming rapidly down to James River, across which is a railroad viaduct; on this an elegant locomotive engine is in waiting, which, in one day will carry the whole train to Baltimore, without delay, without unloading; on the other side are negroes, resting on their poles, inviting the produce to the safe conveyance of their boat under lock and key, down to Richmond, at the rate of two and a half miles an hour, that is in thirty hours! (seven average days!) from Pattonsburgh—the power, said negroes themselves, or some harness and whip-striped mules. Which of these, I ask, will tempt the trade? I answer, the locomotive engine, which will be in Baltimore long before a transfer could be made into the boats, and at a less cost. "Captain Crozet's report contains convincing arguments in support of his position, derived from the capability of the locomotive as demonstrated up to the time in which his entertaining document was prepared. "The Sampson," he observes, "has drawn 150 tons at an average rate of twelve miles an hour, the coke burned not being quite one-third of a pound per ton per mile. While the moving power has received these beautiful improvements, the means of diminishing the resistance have not been neglected. A few years ago, Tredgold estimated the friction at one in 130; N. Wood ventured as far as one in 200. Now, the Winans car enables one pound to draw 450, with small wheels; and that, with outside bearings and chilled boxes, common cars will probably be made with enlarged wheels to be drawn by one pound out of 400, and perhaps more." The report concludes with a couple of sentences which show that Captain C. Crozet had gained that mastery of language which it seems, then distinguished his own city of Richmond more than its zeal for mechanical improvements, and the employment of which would certainly find favor in the Virginian Capital, in the year of grace 1831, on the day after Christmas. "The railroad system is the triumph of the age—the ultimate effects of its introduction are incalculable, and with the certainty that it will produce important changes in the commercial and even political world, its early adoption is safer than its rejection in favor of another system, from which no further developments are to be expected. Such are my opinions and such their motives."

(To be continued.)

THE Railway Car Accountant's Association hold their annual convention at Richmond, Va., on May 20th.

News from United States Consuls.

CONSUL ALBERT D. SHAW, Manchester, England, writes: "There is no mystery about the processes by which English supremacy (in foreign trade) has been obtained. The course they adopted is open to us, and the results they have achieved we can expect to realize, in part at least, when we are as wise, as courageous, and as enterprising as English statesmen and merchants have been, in extending their trade relations among the distant nations of the earth."

LYELL T. ADAMS, Geneva, says: "Any account of the commercial position of Switzerland to-day would be incomplete without some reference to the great changes impending on the completion of the new lines of international communication whose effect will be to make her a commercial, as she already is the geographical and hydrographical, center of the continent. Nothing has isolated her hitherto but the altitude above the sea-level, now overcome by the Brenner Railway and the tunnels of the Mont Cenis, the St. Gothard, and the Arlberg, just opened. By these routes the extremities of Europe are brought into direct relations, the meeting point of all lying upon Swiss territory with the exception of the Mont Cenis. This line crosses Upper Savoy, which by the treaty of 1815 forms part of the Swiss neutral territory to be occupied in war by the armies of the Confederation. One of its main feeders is the West Swiss Railway, from Berne to Geneva, and much of its traffic is likely to be diverted by the projected tunnel under the Simplon. What effect this reconstruction of the European railway system will have on the fortunes of Switzerland it is too early to conjecture."

OUR consul at Vienna, James Wiley Weaver, reports: "Should nothing unforeseen occur to delay the completion of the Arlberg tunnel, it should be opened for traffic in a twelvemonth, to the end that instead of the five years specified in the contract the time would not exceed at most three and a half years from the commencement. The time required to complete Mont Cenis tunnel was fourteen and a half years, and that required for the completion of the St. Gothard tunnel was nine and a quarter years. The Arlberg tunnel when finished will form a very important link in the railway system of Austria. When the tunnel is completed, it is said that the passage will require one and a quarter hours for the ordinary and three-quarters of an hour for the express trains. The new railroad, of which the Arlberg tunnel forms the most important and expensive part, runs from Innsbruck up the right bank of the river Inn to Landeck, a distance of forty-five miles. Here crossing the Inn it ascends the Paznauner and Stanzer valleys to St. Anton, where the eastern terminus begins. The tunnel at this point passes through the Arlberg, a spur of Rhætian Alps, which forms the watershed between the Danube and the Rhine. After passing through the Arl Mountain by a tunnel of 10,270 meters in length, the road continues from Langen down through the valley of the Kloster River and over a mountainous region to Bludenz, which already possesses railway communications with Lake Constance and the east of Switzerland. The distance from Landeck to Bludenz is forty miles, making the total length of the Innsbruck Bludenz line about eighty-five English miles.

O. M. SPENCER, Melbourne, reports the number of miles of railway open and in course of construction in Australasia, on December 31, 1882, as follows: 6,209 miles open, and 1,566 miles in construction. From the report of the commissioner of railways it appears that up to December 31, 1882, the colony of Victoria had expended £19,746,915 in the construction of her 1,355 miles of railway, or an average of £14,573 per mile. The gross earnings for 1882 amounted to £1,781,599, an increase of £115,869 over 1881. After paying £1,098,599 for working expenses, there remained a balance of £682,479, being a net profit of 3½ per cent. on the total cost of construction. This low rate of profit is due, for the most part, to the heavy damages which the government has been compelled to pay on account of several serious railway accidents. The commissioner of railways for New South Wales reported that during the year 1882 the earnings of the railways were £1,698,863, and the working expenditure £934,635. The lines open for traffic yielded 5.14 per cent. on the capital invested. The total expenditure for construction of all the railways in New South Wales amounts to £16,776,642.

IN their *Magazine of Art*, the publishers, Cassell & Company, Nos. 739 and 741 Broadway, New York, issue a monthly which leads the popular periodicals of its class. What it has to say about artists and their work, while free from the unintelligible twaddle which is sometimes made to do duty as art criticism, is well-informed and judicious, as well as clear and readily understood by persons of ordinary culture. The range of subjects treated is wide, as appears from a view of the contents of the April number. A picture from Sandro Botticelli, "Smeralda di Bandinelli" is the frontispiece. Illustrated articles succeeding are "More About Algiers," by J. Arthur Blaikie;" "Battle and Travel," by Professor Nicholas Sobko; "Art in the Garden," by Barclay Day; "Burdlus;" "Northwest Passage," by Robert Louis Stevenson; "Pictures of Japan;" "Pens and Pencils: Wordsworth and Sir George Beaumont," by J. Ashcroft Noble;" "The Constantine Ionides Collection," by Cosmo Monkhouse; "The Country of Millet," by Hugh de T. Slazebrook; "The Chronicle of Art," and American Art Notes." "The Bravo," by Enrique Serra, is a full-page drawing, cleverly brought out by the printer. The letter press and pictures of the *Magazine of Art* are correspondent and agreeable to the nature of its contents.

"THE Tabor Steam Engine Indicator," by George H. Barrus, S. B., member of the American Society of Mechanical Engineers, is a publication of the Ashcroft Manufacturing Company, New York. Mr. Barrus wrote his work, not as an advertisement of the instrument named in the title, but as a book of reference and instruction for purchasers and others interested in the subject. We unhesitatingly commend it to these two classes of persons, as a practical and valuable book, crowded with well-ascertained and well-arranged mechanical information.

RECEIPT of the Report of the Proceedings of the Seventeenth Annual Convention of the Master Car-Builders' Association, is hereby acknowledged. Being a record of the results of practical railroad experience it is a pamphlet of great value.

Communications.

A Suggestive Question.

Editor American Railroad Journal:

HAS the United States government, or that of either of the States, offered a prize for a satisfactory car-coupler? My coupler is the common link and pin coupling so contrived that the link is held in any required position for entering the draw-head of an approaching car, whether it is higher or lower. It will couple every time without the necessity of going between the cars; and can be coupled with any of the common apparatus, using the same link and pin. The draw-heads will not cost over one dollar each more than the common draw-head, and will fit into the same place without making any alteration on the car.

Any railroad company willing to give my coupler a trial, is invited to consider the following proposition: We will make from two to ten at the same price as the common draw-head, and if, after a sufficient trial, they don't give satisfaction, we won't ask any pay for them.

My coupling can be used with or without a bar for drawing the pin. The bar reaches across the car, and is turned back or forth for coupling or uncoupling without a man's going between the cars. Railroad men say they prefer the coupler without the bar. Four of my couplers are working on the Canada Pacific Railway, and giving satisfaction. There is no danger whatever associated with their use.

CHARLES DEVLIN.

PEMBROKE, Ontario, Can., March 25, 1884.

Editor American Railroad Journal:

IN reply to the pungent letter of "Pontifex," in your March issue, permit me to arrange a few old "saws" to help him and others be firm in the discharge of their political as well as of their scientific duties.

Everything in nature has its opposite: Heat, cold; hard, soft; worth, pride; purity, depravity; training, vanity; Christianity, paganism; religion, infidelity; and many other extremes without intermediates.

The difference between each two antipodal conditions is best accounted for by the terse and sapient language of the philosophy which enunciates, "heat is the absence of cold" and "cold is the absence of heat," a decision which proves by two reversible and interchangeable witnesses that "philosophy triumphs readily over past and future dilemmas, but succumbs to those of the present."

With Nature's laws immutable, and the Declaration of Independence as it stands, it is hard to solve by direct means the problem which the thoughtful mind of Pontifex propounds.

If he, with the thousands of others like him, will only take his fraction of "the bull by the horns," and settle the question of precedent with the local officials where the "market price" is too "stiff" to "see" them "one better," by doing, as the ninety pound student did, with his two hundred and fifty pound uncle, the bishop, he will aid the cause of truth; and, may be, if he has good fortune, he may elicit an expression of confidence tantamount to the admiration the Bishop felt when he called his nephew's lift, "a triumph of mind over matter."

The engineer must not expect to find the "lamp of science" among an "ass o! sigh a tion" of political place-holders within the purlieus of any great city. He may not find it within the walls.

The fault lies deep. It is in the school system, which cultivates the "jaw tackle" of the majority, to turn them out with the polish of brass on a lively memory at pubescent age, with the admonition that "the world owes them a living," to act out

"Let others seek for wisdom's way.
"In modern science, modern wit;
"I look t'intrigue for all that these,
"These two can teach is taught by it."

A few follow in the steps of their parents; a few make Christians—science is beneath them. The rest have a "call" to politics, religion or finance.

Some brush up and get an insight into the mysteries of "put" and "call," "long" and "shorts," "margins" and "corners," with a dash of "poker" by holding the edge of their wits on the grindstone of "finesse" and "chicane," during a few weeks seance in some "cheap John" college.

Pot-house politicians are not the only class which is prone to feel that one dollar's worth of private interest weighs more than thousands worth of good to the general public.

Such has been the combination of avarice with political sagacity heretofore, is now, and always will be to the end of time.

Wealth is not to be scorned by any means, but the worship of it is pernicious.

One man may acquire a dollar while another is earning a million. The dollar man may have secured a good margin on what he really earned. The other may throw his whole soul and mind into making his undertaking

the means of sustenance for thousands. The opposites for both cases are easily imagined.

Everybody knows it will not do to have all of any community from one kind of men. There must be an opposite for every force, or good morals will not obtain, good work cannot be done. We must have "rank and file with well trained wills and careful minds to make labor honorable." Then

"Though it be of warlike Hector
"Of a revenue collector; or,
"Though it be the lamest beggar,
"That e'er limped from door to door;
"They'll not ask him of his nation;
"They'll see the man and not his station."

Labor ranks everything.
It conquers everything.

Education sometimes fits a mind to know which horn of a dilemma to take hold of first, but, there is always another head which boasts of having "well corned" "horse sense," which can discount the trained head in promptitude of expression.

The trained man may be a worker; the other is a social or Bacchanalian loafer or gossip, who depends on the "supervisors'" peculations for his standing or creature comforts.

Engineers who love pure science for itself should take time to study human nature in all its nakedness. The purely selfish phase of it can best be understood in all its ramifications by feeding a herd of hungry store hogs. The "swine boss" does not wait till all the rest are through. He does not stand up in the trough, nor does he "squash" out the contents by lying down in it. He gets his fill and then politely and benignly gives room for his mates. No human being can emulate the cool, imperturbable indifference of this hog to the rights of his associates, pending his satiety, or his mannerisms after he is satisfied.

We have got to take things as they are, and face the music as stoics, to vote against the gambling rings. Not only this, but the purity of the ballot box should not be left to the rabble element.

An engineer's life should be "real," "earnest," full of truth. His vote should be on the side of good order and good morals

If he loses heart while his profession is in its infancy, what will other honorable branches do?

Just as a well aimed bombshell will describe a graceful trajectory, and mayhap ricochet to right and left before it bursts in the heart of its objective, so "Socrates" made his "ten-strike" with a "time-fuze" in his liver after being fired from his own door by the diffusion of "useful intelligence." He made a transient triumph, but the "pins" survive him.

When Diogenes carried the candle his quest was fruitless. "Absolute right is unattainable."

PARADOX.

MARCH 31, 1884.

Editor American Railroad Journal:

I NOTICED in your March number, on page 504, a communication from M. Poisot, on the slipping of engine wheels. I would like to give you my own experience in the same line. In the year 1856, or as the almanacs say, the year before or the year after, I was living in the city of Cumberland, Maryland. The Baltimore and Ohio Road had quite recently been opened from that point to Wheeling, through the mountains, and there was another road running up through the mountains also, then called the Mount Savage Road. Both these roads in the winter were very much delayed in their operations by ice and snow.

My former business had led me to make some experiments in the quick removals of snow and ice from some parts of our works, and by experiments I found that nothing would do it so quickly as live steam, and that when it struck iron plates it made them almost as clean as if they had been scoured.

I communicated my ideas to some of the railroad officers, and requested the privilege of making experiments. This could very easily have been done, and with very little expense, by putting a pipe in the forward end of the boiler, branching off to either side, and so arranged that the steam would strike on the rails immediately in front of the wheels, the very same idea the Frenchman arrived at by accident, and it would have undoubtedly produced the same results. If my recollection is correct, I even went so far as to communicate with the *Scientific American* in regard to obtaining a patent, but the railroad men spoke so slightingly of the matter, not even allowing me to make the experiment at my own cost, that I was discouraged from going to the expense of taking out a patent. Every engine driver will tell you how much better his driving wheels will take hold on the rails after a heavy rain. I proposed to do artificially what they found an aid to them from natural causes.

I have no doubt it would do away in most instances with the use of sand, and thus be a great saving to both the rails and driving wheels.

The idea might be carried still farther and be found efficient in working through snow drifts. For going through moderate drifts the engine drawing the train could spare enough steam to cut them out, and where they were more formidable an old locomotive boiler mounted on wheels, with a tender and inspirators to keep up the supply of water, would work through a snow bank faster than any of the expensive machines lately gotten up for the same purpose.

Respectfully yours,

JNO. OLIPHANT.

WATSONTOWN, Pa., March 26, 1884.

Cleveland, Columbus, Cincinnati and Indianapolis Railway.

THE total length of road owned and operated by the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company is 738½ miles.

Following is the board of directors' report of the operations of the company for the year ending December 31, 1883:

The gross earnings have been:

Received from freight		$3,068,717 09
Received from passengers		965,693 47
Received from mail		87,229 47
Received from express		91,466 54
Received from rents		58,810 80
Received from interest and dividends		70,686 64
Total earnings		$4,342,604 01

The expenses have been:

Total operating expenses, 69.50 per cent	$3,018,382 75	
Taxes	125,144 32	
Interest on bonds	507,453 31	
Interest and exchange	26,889 94	
Total expenses, taxes, interest, etc		$3,677,870 32
Net earnings		$ 664,733 69

In a comparison with the results of the year 1882, there is shown:

A decrease in gross earnings of	$98,996.55	or 02.23	per cent.
An increase in operating expenses of	$54,604.33	or 01.84	per cent.
A decrease in net earnings of	$153,600.88	or 10.39	per cent.
A decrease in tonnage of	227,874 tons	or 08.27	per cent.
A decrease in tons one mile of	38,975,134 tons	or 08.71	per cent.
A decrease in freight earnings of	$90,699.56	or 02.87	per cent.
A decrease in freight expenses of	$69,992.35	or 03.05	per cent.
A decrease in net freight earnings of	$20,707.21	or 02.40	per cent.
An increase in net freight earnings per ton mile of	.013 cents	or 06.73	per cent.
A decrease in passengers carried of	59,296	or 05.72	per cent.
A decrease in local passengers carried	36,049	or 04.19	per cent.
A decrease in through passengers carried	23,247	or 13.29	per cent.
A decrease in passengers carried one mile of	1,211,365	or 02.71	per cent.
A decrease in passenger earnings of	$34,576.20	or 03.45	per cent.
An increase in passenger operating expenses of	$124,596.68	or 18.67	per cent.
A decrease in earnings per passenger per mile of	.018 cents	or 00.81	per cent.
A decrease in earnings per local passenger per mile of	.091 cents	or 03.49	per cent.
An increase in earnings per through passenger per mile of	.031 cents	or 01.74	per cent.
An increase in cost per passenger per mile of	.328 cents	or 22.00	per cent.

The amount of tonnage transported during 1883 and the revenue therefrom falls short of the results which should ordinarily be anticipated from a year's work of the railway.

Indeed, for the first half of the past year, or late into the summer, the tonnage and earnings of the line had steadily continued to increase, and in comparison had largely exceeded the figures of any like period in the road's history. But the measurable failure of staple crops subsequently told against the freight revenue, and apparently from the same cause the local passenger traffic was affected. A back-set further came in the autumn, when the railway stood firm in its maintenance of rates upon competitive traffic, bound thereto by the firm policy of its eastern connecting roads, and in consequence saw business surrendered for a considerable time through a one-sided observance of tariffs. The outcome of this disagreement in rates was attended with less general demoralization than might have been expected, and the year closed with the results of the last six months very unsatisfactory. Yet the universal observance of agreed tariff rates, which

throughout the first seven months of the year had obtained almost without exception, did somewhat offset this later loss of traffic from rate-cutting, although in the end the result of such cutting was a disregard of tariff by all roads.

It was from the effects of the seven months accord and good faith between the roads, that the average gross freight rate per ton mile for the year exceeds that of 1882, and is shown to be 0.751 cents, as against 0.706 cents in 1882. The cost freight rate per ton mile for the year is 0.545 cents as against 0.513 cents in 1882.

The tons moved one mile in the year were 408,436,350, as against 447,411,484 in 1882, being a decrease of 38,975,134 tons moved one mile, or 8.71 per cent.

The increased cost of passenger operating expenses is wholly due to rebuilding and advancing to standard the passenger equipment of the line, which work has been substantially completed.

The last annual report set forth the acquirement on the part of this company of the entire interest in the Indianapolis and St. Louis Railway and of its leased line, the St. Louis, Alton and Terre Haute Railroad.

On the sixth day of June last, the stockholders of the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company ratified the modified lease, duly executed by the Indianapolis and St. Louis Railway Company as lessee, and the St. Louis, Alton and Terre Haute Railroad Company as lessor, of the railroad of said lessor, extending from the city of East St. Louis in Illinois to the city of Terre Haute in Indiana, with a branch to the city of Alton in Illinois, for the term of ninety-nine years from the first day of November, 1882. The total number of shares voting were 125,873, and all were cast in affirmation of said lease.

With the determined policy of this company to absolutely control and operate, as a single interest, this road with the other roads in question between Cleveland and St. Louis, including in such management the lines to Cincinnati, there followed the necessity of putting into good and efficient physical condition the St. Louis, Alton and Terre Haute Railroad and also completing the rebuilding and restoration of the line between Terre Haute and Indianapolis.

It was determined that this reconstruction work, great as it was, should be vigorously pushed to completion, having regard to the best interests of all the properties, and to this cause the extraordinary expenditures of the past year are due.

It may be said that the St. Louis, Alton and Terre Haute Railroad has been largely renewed in its track and bridge superstructure, and extensive additions have been made to its sidings and buildings.

Much of the work done, as well as that upon the line of the Indianapolis and St. Louis Railway, is comparatively permanent, and the future requirements of this character of expenditures will be limited.

The outlay was necessitated not only to obtain safety and efficiency in the current working of these roads between Indianapolis and St. Louis, and to secure economical results in their cost of operating, but, with the possession of increased facilities and capacity, to be enabled to command an augmented traffic, the practical effect of which should make the Indianapolis and St. Louis with its leased road not only self-sustaining in themselves, but profitable in their respective outcome.

There has been advanced during the year to the Indianapolis and St. Louis Railway and to the receiver of the Indianapolis and St. Louis Railroad to provide for the outlays just described in carrying forward the plan of this company, a total sum of $1,109,797.88.

There has been advanced to the Cincinnati and Springfield Railway during the year, as follows:

Purchase of land at Cincinnati		$ 81,739 92
Middletown branch		1,250 00
New side-track		5,291 10
Total additions		$ 88,281 02
Deficit in operating, 1883		174,947 78
Making the total sum advanced		$263,228 80

The above charge on account of property addition, is the third and final payment under original contract for station ground in the city of Cincinnati. No further obligation of this character attends the Cincinnati and Springfield Railroad, which has now been mainly relaid with standard pattern steel rails (heavier than the original rails), and whose original wooden bridges have now been entirely replaced with ample iron structures, whilst the road's capacity for service has been largely increased.

It is believed, from the present outlook, that this portion of the C. C. C. and I. property is in a condition, under ordinary circumstances, to be operated with more satisfactory results.

The following expenditures during the year have been made upon the main line on account of additions:

For new equipment:

Additional freight cars	$198,580 65	
Additional locomotives	138,558 78	
Additional passenger cars	15,865 60	
Additional baggage cars	2,080 69	
Total expenditures for new equipment		$355,085 72
New side-track		25,357 65

For lands:

Station ground at Linndale	$1,212 50	
Station grounds at Franklin	1,000 00	
Station grounds at Milford	55 00	
Total expenditures for station grounds		2,267 50
Total expenditures, main line, account additions		$382,710 87

The bonded debt of the company has been increased $930,000.00 during the year, and now stands at $7,295,000.00. The reason for such increase is shown as follows:

In providing for the outlays attending the reorganization of the Indianapolis and St. Louis Railroad, and the renewal and reconstruction expenditures connected with the lines between Indianapolis and St. Louis, it was the decision of your board not to attempt to dispose of bonds or other form of obligation based upon the credit of the Indianapolis and St. Louis Railway Company, but to assume directly on the part of the Cleveland, Columbus, Cincinnati and Indianapolis Railway Company, the carriage of these particular charges. Hence, during the year, sale was made of 998 of the consolidated mortgage bonds, and the current earnings of the main line were also used in part on account of the extraordinary expenditures just alluded to.

The further action of your board has been to order the preparation of a new general mortgage of the Cleveland, Columbus, Cincinnati and Indianapolis Railway, in amount twelve million dollars, to include and ultimately retire all of the outstanding mortgages, and thus yielding about four and one-half million dollars of bonds, as a provision

for the present and future requirements of the railway in its development and additions to its estate.

The mortgage has been completed, and a very limited portion of the bonds secured by it will now be offered for sale, with a view to partly recoup the treasury.

The earnest desire of the board has been for the railway to reach the position where and when under ordinary circumstances at least, the earning and regular payment of dividends could be relied on. Such a position seems more assured to-day, with these properties under one management, and of one interest, connecting the gateways of St. Louis and Cincinnati respectively with the city of Cleveland, and with the solidified railroads now working in the fullest accord as a part and portion of a trunk line system between the Atlantic seaboard and the Mississippi Valley.

The roads in their physical condition mile for mile will compare favorably with the best, and the equipment has been thoroughly maintained.

For the extraordinary amount of work successfully accomplished, and for the results of the year, much is due to the chiefs of the various departments under the lead of the untiring general manager, to all of whom and to the employés generally, recognition is rendered for their faithfulness and efficiency.

Respectfully submitted by order of the Board.

J. H. DEVEREUX, *President.*

CLEVELAND, February 25th, 1884.

The directors elected for 1884 are as follows:

W. H. Vanderbilt, New York; C. Vanderbilt, New York; Augustus Schell, New York; J. H. Rutter, New York; A. G. Dulman, New York; W. Bayard Cutting, New York; J. H. Devereux, Cleveland; Stevenson Burke, Cleveland; James Barnett, Cleveland; T. P. Handy, Cleveland; Amos Townsend, Cleveland; G. H. Russell, Cleveland; B. S. Brown, Columbus; and the officers: J. H. Devereux, president; Stevenson Burke, vice-president; George H. Russell, secretary and treasurer; and E. B. Thomas, general manager.

Railway Matters in Canada.

TRAFFIC RECEIPTS OF THE CANADIAN PACIFIC DURING 1883—PROPOSED EXTENSION OF THE CENTRAL ONTARIO—RUMORED STRAINED RELATIONS BETWEEN THE CANADIAN PACIFIC AND THE ST. PAUL, MINNEAPOLIS AND MANITOBA—THE PROPOSED GREAT NORTHERN RAILWAY—DIRECTORS OF THE MONTREAL AND SOREL RAILWAY—RAILWAY TO BE BUILT IN CAPE BRETON—DOUBLE TRACKS ON THE GRAND TRUNK WANTED—PROPOSED BRIDGE ACROSS THE ST. LAWRENCE.

THE importance of the government scheme for assisting the Canadian Pacific—now passed—seems to belittle such railroad information as lies in your correspondent's way to present on this occasion. It may be well to say here that the traffic receipts of the Canadian Pacific Railway for 1883 are stated at $5,281,811, an increase of $2,648,391 over 1882.

A bill has been reported to the Dominion parliament, to authorize the Central Ontario Company to extend its line northward to the Canadian Pacific. The extension is expected to be used largely for carrying iron ore, which finds a market in the United States.

The rumor is widespread that at the next meeting of directors of the St. Paul, Minneapolis and Manitoba Railway, George Stephen, R. B. Angus and Donald A. Smith will be dropped from the board. Two reasons are given for this by the Montreal *Witness*. The above members of the Canadian Pacific syndicate, having not much further use for the St. Paul road in view of the progress of their own, have disposed of their interest in the former. Moreover, the relations of the above three directors with the president, Mr. Hill, have for some time been wanting in harmony. Mr. Hill is believed to have stoutly opposed the construction of the Canadian Pacific line on the north of Lake Superior, as it would take away a large part of the St. Paul road's traffic. The St. Paul road only runs to the frontier, and its connection between that point and Winnipeg has to be made over the Canadian Pacific track. Messrs. Hill and Kennedy having parted with their interest in the Canadian Pacific, the separation between the lines is now completed by the withdrawal of the syndicate from the ownership of the St. Paul and Manitoba.

The length of the great Northern Railway, to be made from the Ottowa River to St. Raymond will be 138 miles, and it is expected it can be built over an excellent location, very straight, comparatively level, and with maximum grades of about fifty feet per mile, at a cost of about $20,000 per mile. By this line the distance from Quebec to Montreal will be only twelve miles longer than the North Shore, whereas to Ottawa it will be forty-four miles shorter.

The newly-elected directors of the Montreal and Sorel Railway Company, are: James Armstrong, president; John Rankin, vice president; L. N. Massue, M. P., G. B. Carter and D. N. Armstrong.

The local legislature has granted a charter to the Cape Breton Railway Extension Company to construct a railway on the island of Cape Breton, the company to have the right of way, subject to action of municipal councils, and two thousand acres of land per mile. The line will be some eighty miles in length, extending from the Strait of Canso to Louisburg. The incorporators of the company are F. E. Sicope, president of the Anglesea Railway, Philadelphia; W. E. Crittenden, Bucyrus, Ohio; Hosea T. Stock, Toledo, Ohio; Wm. D. Church, Zanesville, Ohio; A. T. Tullock, Leavenworth, Kansas; John and Darby Bergin, Cornwall; James J. White, Ottawa; L. M. Shute, Philadelphia; Samuel Coulson, Montreal. The company will organize immediately with headquarters at Halifax.

The Grand Trunk Railway Company has a bill before the Dominion parliament to enable it to make certain financial arrangements with a view of obtaining funds to double its track west of Montreal. The cost of this work would be $13,500,000.

The proposed bridge across the St. Lawrence, at or near Quebec, the erection of which will be assisted by the government, is to be a modified reproduction of the bridge which is now being built over the Firth of Forth. The total length from shore to shore is placed at 3,100 feet, the superstructure at 2,800 feet, the two shore spans at 550 each, the two cantilever post sections 150 feet each, and center span 1,400 feet. The lengths of the superstructure of the Forth Bridge are about one-fifth greater. The cost of the bridge is estimated at $4,000,000. The government is asked to guarantee four per cent. on the amount.

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

COMPRESSED AIR AS THE MOTIVE POWER ON TRAMWAYS.

WHILE New York is making up its mind to try the cable system of operating conveyances on tramways, San Francisco is considering seriously the expediency of superseding it by a system which is reported to be much more economical, both in first cost and operation. Indeed, machinery is now being constructed in that enterprising city, for the purpose of testing an invention for running the street cars by means of compressed air. Should coming experiments demonstrate the practicability of this, the Omnibus Railway and Cable Company of San Francisco will immediately adopt it. We think that if New York is wise, steps will be taken to prevent an enormous expenditure of money in what may prove to be, in a few months' time, an old-fashioned and superseded method of operating public conveyances. If it be so that the cable system is better than traction by horses, it may be that traction by means of compressed air would be more expedient than that by means of the cable.

With regard to this latter it has always been urged against it, that there is a large waste of power in its operation. The statement is made that only fifteen or twenty per cent. of the power is utilized in traction, the rest being expended in moving the cable and in friction. Accidents are numerous from the machinery getting out of order, and stoppages in the running of cars are unlooked for, sudden, and not infrequent. Moreover, the limit of the utility of the cable system in the case of curved ways, is reached disappointingly soon.

We await news from San Francisco, of experiments in operating tramway cars by means of compressed air, with keen interest. What remains to be done at the present time is to acquaint our readers with the details of the system as proposed.

By the new invention air is used at its lowest pressure to secure economy, or from eighty to 100 pounds per square inch. The machinery will be made light to lessen the amount of dead weight carried. The difficulty of keeping up a constant uniform pressure within practical limits seems to be removed by the new invention. It is proposed to erect an air-compressing machine at each end of the railway, which will send the air along a four-inch pipe main. The main will be two feet below the surface of the ground, between the up and down tracks. At every block, or closer if desired, there will lead from the main to the center of the track a branch pipe two inches in diameter, terminating in a valve-chamber with a valve held close by the pressure and spring. Above the chamber is an opening or slot in the street pavement to allow easy access to this branch pipe. On the car or dummy there is a couple of small storage tanks, each of thirty feet capacity, set under the car seats out of sight. An engine connects with the car wheels, and receives its supply of motive power from the air tanks. Leading from one of the storage tanks, both of which are connected, is a rubber hose, terminating in a nozzle like that of a fire hose. A small valve is placed in the end and kept closed by a spring. When the car stops for a passenger the engineer takes down the hose and inserts it in the slot or opening in the car track, and immediately two valves, one in the nozzle and the other in the branch pipe, are pressed apart and the air flows from the main into the storage tank on the car.

The Dublin United Tramways Company.

THE sixth ordinary meeting of the shareholders of this company was held in Dublin, Ireland, February 5, 1884.

It appeared from the director's report that the gross receipts for the half year ending December 31, 1883, amount to £55,445 0*s.* 6*d.*; and the working expenses to £40,934 3*s.* 2*d.* This leaves £14,510 17*s.* 4*d.* as net profit, which, together with £1,073 18*s.* 9d. brought forward from last half-year, is carried to net revenue account. The sum available for division, after writing off £921 1*s.* 1*d.* from valuation of horses and suspense account, and providing for debenture interest (amounting to £1,146 3*s.* 11*d.*), is £13,517 11*s.* 1*d.* Of this it is proposed to appropriate £10,974 to the payment of a dividend at the rate of four per cent. per annum (free of income tax), being four shillings per share for the half-year, the balance, £2,543 11*s.* 1*d.*, being carried forward. The gross receipts for the half-year show a decrease of £102 1*s.* 11*d.* as compared with the corresponding period of 1882. Three new cars were turned out of the company's workshops, and the whole cost charged against the revenue of the half year. The Forage account shows a decrease, the cost per horse per week being under 10*s.* 5*d.* The parcels delivery traffic is steadily extending, and shows a profit on the working for the half-year. The company had, on December 31, 976 horses. Thirty-two miles were open on that date. The total number of passengers carried during the half year was 5,406,813.

THE Comte de Liedekerke, representing a Belgian house, has obtained the concession of a network of steam tramways in Navarre, Spain, comprising a line from Pampeluna to Logrono, a second from Pampeluna to Irun, a third from Irun to Sanguesa, and a fourth from Puerta la Reina to Tafalla.

AT a meeting of the directors of the Brooklyn and Long Island Cable Railway Company, on the 15th inst., the following officers were elected: J. Rogers Maxwell, president; William Richardson, vice-president; Newberry H. Frost, treasurer, and Charles Bruff, secretary. The president, vice-president, treasurer, and Henry W. Maxwell were appointed on the executive committee.

THE first town to be entirely lighted and have its tramcars driven by electricity will be Montreaux, on the Lake of Geneva, a company having obtained a concession for the purpose. The motive power will be derived from the water of the lake.

Iron vs. Steel for Horse Railroad Tracks.

THE following letter from Mr. Augustine W. Wright, of Chicago, will be read with interest by all street railroad men. We shall be glad to have the views of practical men on this matter; our columns are at their service.

Editor of the American Railroad Journal:

I WAS asked at the last convention of the American Street Railway Association the following question by Mr. Cleminshaw (see report of second annual meeting, page 28): "You would recommend the use of steel rails for street railroads, would'nt you?" I replied in the affirmative, and stated that one steel rail would outwear five iron rails!

This opinion was formed from my experience upon *steam* railroads, and in support thereof, I would quote Mr. Price Williams, who stated that "the average life of the best quality of iron rails has been found to be in round numbers 15,000,000 tons. Vose, p. 361 of his manual, states that a pair of Bessemer steel rails on the London and Northwestern Railway outlasted sixteen faces of iron rails carrying 95,577,240 tons. (So, too, upon the Philadelphia, Wilmington and Baltimore R. R., a good steel rail has outlasted sixteen iron rails.) Where 12,000,000 or 15,000,000 of moderately fast traffic will wear out an iron rail, 38,000,000 tons of slow traffic are required to do the same.

Since October, 1883, when the above convention met, I have given this subject much consideration, and at the present time I am of the opinion that a *good* iron rail is best for many horse railroads. D. K. Clarke, in Vol. 2 of his work on Tramways, p. 171, says: "As to the material for tram-rails, it is not quite clear that steel is preferable to iron. The results of respective wears of steel rails and iron rails in Glasgow, reported by Messrs. Johnstones & Rankine, appear to show that the iron rails were as durable as the steel rails; whilst it is also apparent from the results of Mr. Cockburn Muir's tests for deflection that iron rails were, within their elastic limits, practically as stiff as steel rails." Dr. Dudley, chemist of the Pennsylvania R. R., in his able paper on "The Wearing Power of Steel Rails," said: "The forces that act between the top of the head of the rail and the wheels in rolling friction may, it seems to me, be regarded as two in number. There is first, a force acting directly downwards, due to the weight of the locomotives and cars. This force may be regarded as a vertical force acting perpendicularly to head of the rail, and is in action both when the train is standing still and when it is in motion. Secondly, there is a force acting parallel to the head of the rail, due to the traction or impelling power of the locomotives. In the case of the driving wheels, this force may be supposed to act in the direction opposite to that of the motion of the trains. * * * In the case of the drivers, the amount of this force acting parallel to the head of the rail is sufficient to overcome the total train resistance; in other words, to cause the train to move. In the case of the other wheels of the train, acting individually, this force parallel to the head of the rail is small, being only that necessary to cause the wheels to turn round; in other words, to overcome the journal friction. The force parallel to the head of the rail acts only when the train is in motion."

Returning for a moment to the conception previously mentioned, that the top of the head of the rail and the surface of the wheel are a rack and pinion with infinitesimal teeth, but without regularity in the teeth, let us see what kind of strain would be produced in these minute teeth by a force acting diagonally to the line of the head of the rail. I hardly see how we can avoid the conclusion that this strain would be a bending strain. * * * If we are right in regard to the nature of the surfaces involved in wear and the strains produced, wear is simply the breaking or pulling off of the infinitesimal teeth by the strains to which they are subjected. And here we see why it is that the softer rails give the better wear, for the harder the steel the more brittle it is; and the more brittle the steel the more readily will these infinitesimal teeth be broken off by the strains applied." A Penn. engine for passenger service, class "K" weighs, in working order, 96,700 lbs., of which 32,900 lbs. is on the first pair of drivers. Mr. Chanute's experiment showed that a driving wheel 5 ft. diameter only bore the thickness of a knife blade upon the rail head, about ¼ square inch, and at 40,000 lbs. per square inch of static pressure, the weight upon the driving wheel being 10,000 lbs.

Upon a horse railroad the rails are not subjected to this terrific force, and have only to support the *direct* pressure, due to weight of car and its load, and the force required to overcome journal friction, as so plainly shown by Dr. Dudley. The service performed by the rails upon steam and upon horse railroads is quite different. On the former the rail acts as a girder, carrying the weight from tie to tie. On the horse railroad it is, or should be, considered merely as a wearing surface to protect the continuous timber structure. The latter, besides cross tie bearing, is tamped, so that the track has a continuous bearing upon the earth. The force exerted by the locomotive, which is the prime cause of wear upon steam railroads, does not exist upon horse railroads.

Very few steam railroads can give the relative durability of steel and iron rails, and this is also true of horse railroads. I candidly admit that I cannot myself do so. Much depends upon the quality of the iron and of the steel if they are laid side by side. Steel rails that I laid on our main line Aug., 1879, are wearing rapidly and developing spots, but I have not yet had to replace steel rails. Our traffic, and consequent number of cars, increases rapidly, as does also the number of vehicles traveling upon the rails. The life of the iron rails replaced by this steel cannot, therefore, be compared with the life of the latter, the conditions vary so greatly.

The present cost of steel and iron is about the same, $37 per ton at mill. When worn out, the iron is worth as scrap, $20 per ton, and there is only a limited demand for the steel scrap. The president of one of the largest rolling mills in this country told me he would not give $5 per ton for old steel rails, delivered at his mill.

This is a matter fraught with great interest to all street railroad companies, and I trust, Mr. Editor, that this letter may call forth facts from the various companies, and would recommend it for discussion at the next convention of the American Street Railroad Association.

Respectfully yours,

AUGUSTINE W. WRIGHT.

CHICAGO, April 7th, 1884.

THE *Railway Review* gives the following statement of the earnings of the street railroads of New York city for the year 1883:

	Gross Earnings.	Operating Expenses.	Net Earnings.
Broadway and Seventh ave.	$ 889,614	$ 598,627	$ 290,986
Belt Line	789,906	547,560	252,346
Christopher & Fourteenth st.	219,869	174,471	45,397
Dry Dock & E. Broadway	890,796	574,595	316,200
Eighth avenue	752,590	559,630	192,960
Forty-second & Grand st. Ferry	419,275	268,926	150,349
Harlem Bridge & Fordham	157,402	129,058	28,314
Houston & West st.	224,768	172,305	52,462
Fourth ave.	740,000	502,732	237,066
Ninth ave.	133,094	157,015	6,079
Sixth ave.	856,850	667,137	189,712
Second ave.	899,719	661,880	237,838
Third ave.	1,524,568	1,034,311	490,257
Central Cross Town	168,436	135,980	32,457
Twenty-third st.	521,055	362,732	158,323
	$9,107,942	$6,516,959	$2,680,746

New Brake for Tramway Cars.

GEORGE W. COFFIN, Pittsburgh, Pennsylvania, has invented a device which has for its object the setting, releasing and adjusting the brakes of a car, by means of a worm or perpetual screw operating in a toothed wheel attached to a cylinder or drum carrying a chain connected to a lever of the brakes, so that by turning the perpetual screw in one direction the chain will be wound around the drum in such a manner as to draw the brakes gradually and tightly against the wheel of the car, and there rigidly hold them without danger of relaxation or sudden release until so required, when by turning the perpetual screw in a reverse direction the chain will be unwound, whereby the brakes may be at liberty to fall back from the wheels.

To put his invention into practice, Mr. Coffin constructs a metallic box, preferably formed in two pieces substantially alike, which constitute a receptacle and support for such parts as are intended to operate therein. The two halves of this box are securely united the one to the other by means of vertical bolts, of sufficient length to pass through and thereby affix the box underneath the platform of a car. The rear end of this box is open, and in the forward or closed end is arranged in bearings a short hollow cylinder, across the outside of which is formed a spiral worm or perpetual screw. As a means for rotating this screw it is provided with a removable axis or shaft, the lower part of which is square, and in that respect corresponds with the hollow of the cylinder through which it extends. The upper end of this shaft is furnished with an ordinary winch or hand crank, by the instrumentality of which power may be applied to the screw. At right angles to the spiral worm, and centrally within the box, is arranged a small shaft, carrying a toothed wheel, which engages the perpetual screw; and

this wheel is provided with a cylindrical drum, having attached thereto one end of a chain, the other end of which is connected to a long rod, made fast to the lever of the brake. It is obvious that on turning the screw in one direction the toothed wheel will rotate and wind the chain upon the drum, and thus draw the brakes against the car-wheels and there hold them without the use of clutch or analogous contrivance. When required, they may be released by simply turning the screw in a reverse direction.

Superior applicability to street cars is claimed for this brake, because it requires no ratchet. As it holds just where it is left, the driver can take his hands off the crank, and give more attention to the horses and his lookout for passengers. The chain and upright shaft with crank ordinarily in use will answer for the Coffin brakes, by having the lower end of the shaft made square for about six inches, so that it will fit the worm.

The inventor claims all the advantages in the use of his brakes for railroad cars which he does for street cars, even more; for instance: If a loaded car is placed on a siding, the brake can be drawn tight, and the upright shaft removed and thus prevent accidents by persons loosening the brakes. On platform cars when loaded with timber or lumber which reaches over the brakes, the upright shaft can be removed in an instant, thus obviating the danger of breaking or bending the shaft. The advantage of dispensing with the ratchet is obvious. Mr. Coffin's invention is under examination by the Pennsylvania Railroad Company.

TRAMWAY NOTES.

TWENTY new cars were put on the New York Fourth Avenue Railroad, March 29. They are provided with iron life preservers, which, in the form of a semicircle at the front and back of the cars, prevent the horses from going under the vehicle in case they fall, and act as a similar safeguard in regard to men and women. At the side of each window hangs a leather strap, which when pulled operates upon a small whistle, designed to attract the attention of the conductor. The cars are ventilated along their entire length. The carpeting on the seats is flowered and of the brightest shade of red. New horses and newly-engaged conductors, wearing a uniform, increase the attractiveness of the addition to the facilities of the route.

OUR contemporary, *Tramways*, a well-informed and useful exchange, published in London, reports the organization of "The Tramways Association of Great Britain and Ireland," on the third of March last. The object of the association as stated in the above paper, is that it shall "fully and fairly represent the important interests connected with tramway enterprise." Robert Hutchison, of Carlowrie, chairman of the Edinburgh Street Tramways Company, was elected the first president; and Jenkyn Ingram, secretary. *Tramways* devotes large space to reports of meetings. Its matter is well-arranged and neatly printed. The issue of March 15 was the fifth from the beginning.

PART I of the new Tramways and Public Companies Act (Ireland), enables the grand jury of a county to guarantee out of the rates of a barony a dividend not exceeding £5 per cent. of the paid-up capital of a tramway company. The treasury returns half the guarantee paid by the county, not exceeding £2 per cent. per annum in the paid-up capital, and in this respect the treasury is not to exceed £40,000 a year. Part II increases the financial powers of officials in assisting emigrants, and enables the treasury to assist public companies with funds to enable them to acquire land for sale to tenants.

A $25,000 horse railroad is to be built in Holyoke, Mass., and will probably be in operation by June. The road will be built from South street at South Holyoke, to the foot of North Main street, South Hadley Falls, a distance of two miles. A track about 500 feet long will be laid from the corner of Lyman and Main streets to the new depot of the River Road.

THE Rasmussen Western Cable Railway Co., has been incorporated. The incorporators are W. C. Wachsmuth, M. A. Farr, E. L. Brewster. The capital stock is $1,000,000.

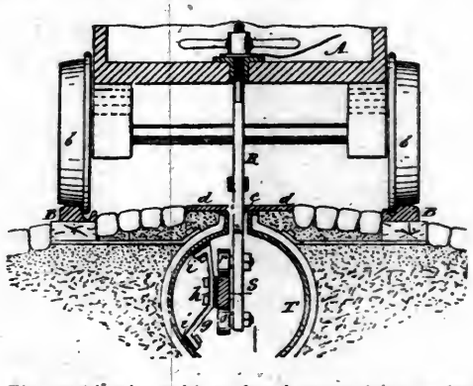
THE work of laying the cable road on Seventh and Franklin streets, Philadelphia, will be commenced shortly.

B. W. RUSSELL has been elected treasurer of the new Danvers and Salem Street Railway Co.

Recent Inventions Relating to Tramways.

294,618. GRIP FOR ELECTRIC CARS: John Carlos Henderson, New York, N. Y.

Brief.—Device for increasing friction of car-wheels upon rails of the track. The bar S may serve as electrical conductor.

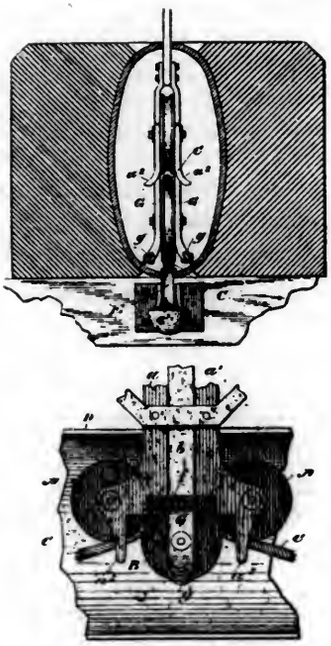


Claim.—The combination, with an electric-motor drive-car having a hole in its bottom, of a top-threaded rod R, carrying a nut at the upper end and rollers *r s s* at the lower end, and the longitudinally-slotted tube T, carrying within it the fixed rail S, as and for the purpose described.

294,948. GRIPPING MECHANISM FOR TRACTION-CABLE RAILROADS: John W. Young, Fort Maroni, Ariz.

Brief.—Gripping-sheaves arranged relative to each other, so that when applied the cable will be positively nipped between them. The movable hanger has depending arms carrying one of the sheaves, which arms rest upon the bottom of the cable-tunnel when the car is at rest, thus steadying the grip-frame while the cable is running through the grip.

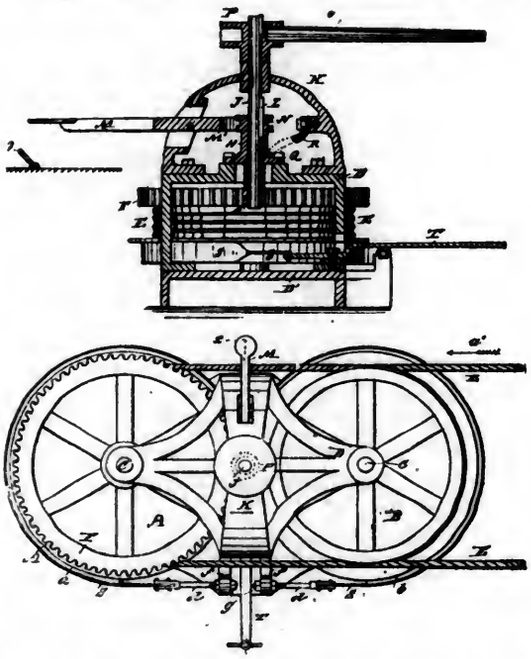
Claim.—1. In a grip mechanism for traction-cables, the combination of two sheaves for gripping an endless traveling cable with mechanism for operating one or both of the sheaves, said sheaves not being directly opposite to each other with respect to the cable, but so arranged that they will press on both sides of the cable when the grip is applied to its full extent, substantially as and for the purpose set forth.—2. In a grip mechanism for traction-cables, the combination of two sets of sheaves for gripping an endless traveling cable, one of which sets may consist of a single sheave, with mechanism for operating one or both sets of sheaves, said sheaves alternating with each other, and arranged so that they will press on both sides of the cable when the grip is applied to its full extent, substantially as and for the purpose set forth.—3. In a grip mechanism for endless traveling traction-cables, the combination of sheaves A A' and sheave B with mechanism for drawing the latter sheave in toward the former pair of sheaves, the sheave B being placed opposite the space between the sheaves A A', and the width of the space between the sheaves A and A' being less than the diameter of the sheave B plus twice the thickness of the cable to be used, said sheaves being constructed so that they will pinch the cable when the grip is applied to its full extent, substantially as and for the purpose set forth.—4. In a grip mechanism for endless traction-cables, the combination of the movable hanger *b*, supporting-legs G, and cable-lifting sheave B, journaled in said legs, with the cable-guide D, and suitable cable gripping and sheave-lifting devices on a car, substantially as herein set forth.—5. In



a grip mechanism for endless traction-cables, the combination of the stationary hangers *a a'*, having bottom outwardly-turned guides, *a'* with the sheaves A A' and the movable hanger *b* and sheave B, substantially as and for the purpose set forth.

294,953. FRICTION-DRUM FOR INCLINED-PLANE CABLE-RAILWAYS: Earle C. Bacon, Brooklyn, assignor to Copeland & Bacon, New York, N. Y.

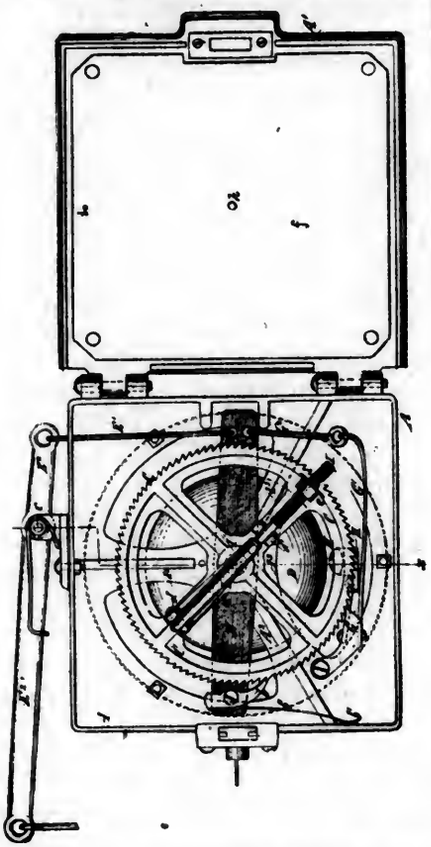
Brief.—The endless cable of an inclined railway is rove around two drums at the top of the incline, a strap-brake being applied to each drum and operated by one lever. The initial movement is given to the loaded car through a vertically-adjustable rotary shaft carrying at its lower end a pinion which is capable of meshing with a gear upon one of said drums.



Claim.—1. In a cable-railway, the combination, with the cable, of two friction-drums, around which the cable passes, and of a brake-band for each drum, substantially as herein shown and described, and for the purpose set forth.—2. In a cable-railway, the combination, with the cable, of two friction-drums, around which the cable passes, a brake-band for each drum, and of devices for applying both brake-bands simultaneously, substantially as herein shown and described, and for the purpose set forth.—3. In a cable railway, the combination, with the cable, of two friction-drums, around which the cable passes, a brake-band for each drum, and a lever connected with both bands, substantially as herein shown and described, and for the purpose set forth.—4. The combination, with a friction-drum, of a brake-band, S, the lever T, the rod *d*, and the tension-adjusting nut *g*, substantially as herein shown and described, and for the purpose set forth.—5. The combination, with a friction-drum for a cable, of a cog-wheel united with the said drum, and of a pinion mounted on a shaft that can be rotated, which pinion is adapted to be engaged with the cog-wheel, substantially as herein shown and described, and for the purpose set forth.—6. The combination, with a friction-drum for a cable, of a cog-wheel united with the said drum, of a pinion mounted on a shaft that can be rotated, and devices for engaging the pinion with the said cog-wheel, substantially as herein shown and described, and for the purposes set forth.—7. The combination, with the cable-drum A, of the cog-wheel F, united with the same, the shaft J, provided with devices for turning it, the sleeve H, the pinion G, mounted thereon, and devices for vertically adjusting the said sleeve, substantially as herein shown and described, and for the purpose set forth.—8. The combination, with the cable-drum A, of the cog-wheel F, united with the same, the shaft J, provided with devices for turning it, the sleeve H, the pinion G, the lever M, the ratchet-wheel Q, and the pawl R, substantially as herein shown and described, and for the purpose set forth.

295,051. FARE REGISTER OR RECORDER: Reuben M. Rose, Brooklyn, N. Y., assignor to David F. Atkins, same place.

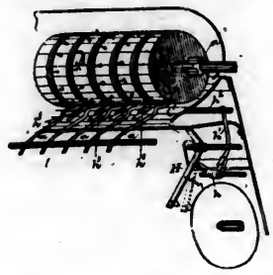
Claim.—1. In a fare register and indicator, the combination of a concealed dial and means for recording or marking thereon, a visible dial and an index



for indicating thereon, and a hollow spindle carrying said index, and serving as a passage for a rod by which the recording or marking device may be operated or moved to cause it to register or mark on the concealed dial, substantially as described.—2. The combination, with a ratchet-wheel, a hollow spindle on which the wheel is mounted, and means for imparting a step-by-step rotation to the said wheel, of a dial, a radial arm carried by said wheel and provided with a marking device, and a pin adapted to be inserted through the hollow spindle to press upon the said arm, and so cause its marking device to make a deep or heavy impression on said dial, substantially as herein described.—3. In a fare register and indicator, the combination of a case composed of two portions hinged together, a spindle and a marking device adapted to turn therewith, both being supported and carried wholly by one portion of the case, a filing or indicating point on the other portion of the case in such position that when the case is closed said point will be opposite the center of the spindle, and a paper or analogous dial provided with a hole adapted to said filing or indicating point, whereby provision is afforded for properly centering the dial relatively to the spindle when the case is opened to enable the dial to be placed in position, substantially as described.—4. The combination, with the ratchet-wheel, C, means for imparting to it a step-by-step rotary motion, and a radial arm provided with a marking device carried by said wheel, of the back plate A', provided with a central gage, and the dial J, provided with a central opening, substantially as and for the purpose herein described.—5. The combination, with a fare register or indicator case having a bridge provided with a central bearing extending across it and dividing it into two compartments, of a spindle fitting the bearing, a ratchet-wheel and its actuating-lever mounted on the spindle on one side of the bridge and in one of said compartments, a bell approximately concentric with the spindle and arranged on the other side of the bridge in the other compartment, and a bell-hammer actuated by said ratchet-wheel and extending across or beyond the bridge to operate on the bell, substantially as herein described.—6. The combination, with a bell-hammer and a spring for impelling it against a bell, of a puli-rod or device for operating the bell, and a connection between the spring and pull-rod or device, whereby the force of the spring will be increased at the time the blow is struck by the hammer, substantially as and for the purpose herein described.—7. The combination, with the ratchet-wheel C and the bell-pawl G, of the spring G', connected with the bell-pawl, mechanism for imparting a step-by-step rotation to the said wheel, and a pull-rod or device connected with the said mechanism for operating it, and also connected with said spring for simultaneously increasing its force, substantially as herein described.—8. The combination of the spindle B, wheel C, lever E, pull-rod or device E', actuating-pawl *b*, bell D, bell-pawl G', and rod C, all arranged and adapted to operate, substantially as herein described.—9. The combination, with the visible dial *j* and hand or pointer, *l*, of the setting bar or arm L, the notched rim *m*, and the removable stop-pin *p*, all arranged and adapted to operate, substantially as and for the purpose herein described.

294,462. FARE-BOX: Jas. F. Goodridge, Boston, Mass.

Claim.—In a fare-box, the combination, with the ticket feed-roll and its actuating mechanism, of an alarm, a stop to prevent the alarm from sound-



ing, and means, substantially as described, by which the passage of a ticket will remove the stop and allow the alarm to sound, substantially as and for the purposes set forth.

CONSTRUCTION NOTES.

THE Lackawanna road has been trying to devise some method whereby it could reach Toledo and make connection with the Wabash road without using the present trunk lines. It has now decided to build its own line, and, according to an officer high in authority, a number of engineers will be at work, shortly, under the direction of C. C. Rose, principal assistant engineer. The line will begin at a point near South Buffalo, and will follow the line of the Nickel Plate and Lake Shore Roads to Toledo. It was thought that an arrangement would be entered into with the Buffalo, New York, and Philadelphia by which the line of the latter would be used to Brockton, but it is understood this will not be, and the company will build its own line between the points named. A mysterious survey along the north side of the Lake Shore was made last summer, and this is thought to have been one of the preliminary lines. But nothing definite could be found out about it. The new line will be pushed rapidly to completion as soon as it is located.

OVER SIX MILES OF TUNNELS.—In constructing the new Vanderbilt route from Harrisburg to the Western Pennsylvania bituminous coal fields, it will be necessary to tunnel the Blue Ridge, Kittanning Mountain, Tuscarora Mountain, Sidelong Hill, Ray's Hill, the Allegheny Mountains, Quinnamahoning range, and the Sewickley Mountains, making over six miles of tunnels. These tunnels are on eighty-three miles of the route. The Blue Ridge and Kittanning tunnels are only a mile apart, and the Sidelong and Ray's Hill tunnels only two miles apart. The work is under contract to be completed by June 1, 1886.

THE matter of securing the right of way for the proposed new railroad from Fort Plain to Richfield Springs is nearly settled. It is now confidently held that work will be commenced at once, and vigorously pushed during the spring, so as to catch a share of the summer traffic.

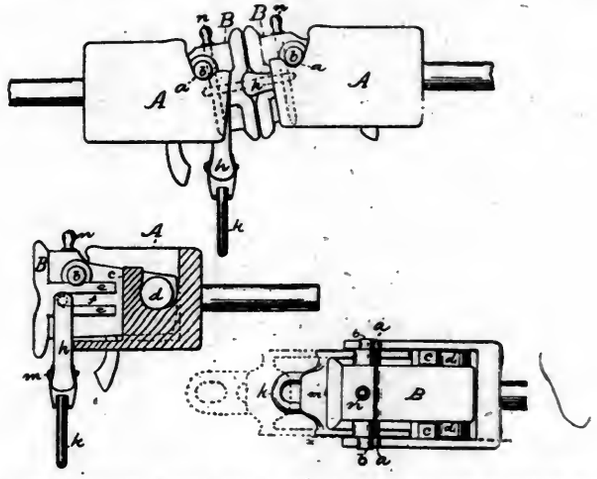
ARRANGEMENTS have been made by the Reading Railroad Company for widening the cuts along the Lebanon Valley Railroad, to prepare the road for the increased travel expected when the Vanderbilt line from Harrisburg to Pittsburgh is ready. Wherever there is only a single track now, a double track is to be laid.

THE plan of a bridge over the St. Lawrence River, to be constructed by the Ottawa, Waddington and New York Railroad and Bridge Company, was adopted by the Privy Council at Ottawa, Canada, on March 14th.

Recent Patents Relating to Railways, Machinery, Etc.

294,345. CAR-COUPLING: Arthur H. Armstrong, Plainville, Conn.

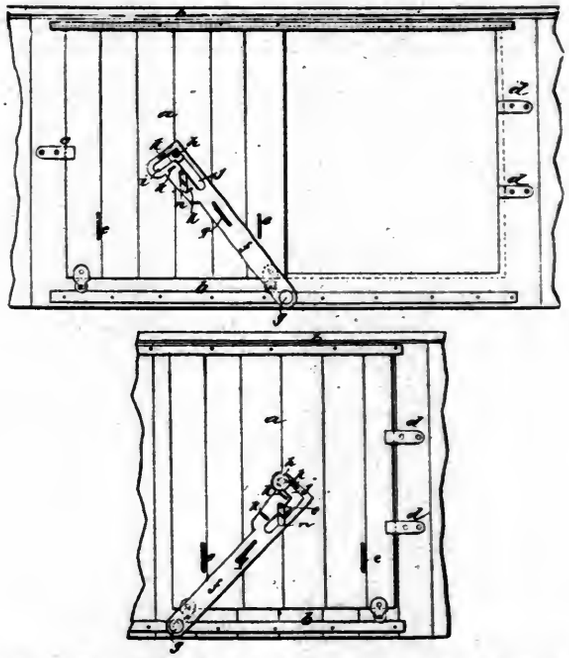
Claim.—The combination of the main head A, having trunnion-recesses *a* at its outer end, and the cheeks *c* upon the inside at its inner end, with the supplementary head B, having trunnions *b* and *d*, and the latter of which receives the drawing strain, substantially as described, and for the purpose specified.



—2. The combination of the coupling, the longitudinally sliding and swinging bail, and the coupling-link secured within the cross-arm of said bail, substantially as described, and for the purpose specified.—3. The combination of the supplementary head B, having side cheeks *c*, the longitudinal slot *f*, and the swinging bail *h*, carrying link *k*, and having inwardly-projecting trunnions *g*, for engagement with the slot *f*, substantially as described, and for the purpose specified.—4. The combination of the main head A, supplementary head B, and the sliding and swinging bail carrying the coupling-link, substantially as described, and for the purpose specified.—5. The combination of the main head A, supplementary head B, the bail carrying the coupling-link, and means located within the walls of the main head for guiding the inner end of the bail longitudinally, and also allowing it to swing freely within said walls, whereby the bail is protected from injury, all substantially as described, and for the purpose specified.

294,513. CAR-DOOR LOCK: Jas. Sharkey, Honey Creek, Ind.

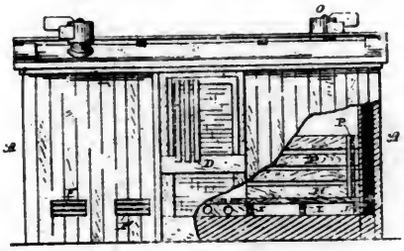
Brief.—A latch-bar pivoted under the lower back corner of the door-opening is connected to the middle of the sliding door by a stud-pin on the door engaging an angular slot in the end of the bar. The stud-pin is held in the end of the slot by a sliding bolt on the latch-bar held by a pivoted link secured over a staple on the sliding bolt.



Claim.—1. The combination, with a sliding door, of a latch-bar *f*, pivoted to a permanent support at the lower back corner of the door and connected to the door at the middle, or thereabout, by a stud-pin *k*, in the door and the angle-slot *i j* in the bar, said bar being inclined, so that it gravitates to a rest at the upper end of slot *j* on the stud *k*, and thereby forms a latch to fasten the door shut, substantially as described.—2. The combination of a slide-bolt *l*, having staple *m* for a lock, *p*, with the latch-bar *f*, having staples *k* and link *n*, pivoted to a support and connected to the door, as shown and described, the said staples *k* and bolt *l* being located between the part *i* of the slot and the stud *k*, to lock said stud in the upper end of part *j* of the slot, substantially as described.

294,574. CAR: Richard H. Briggs and Cleveland Prichard, Whistler, Ala.

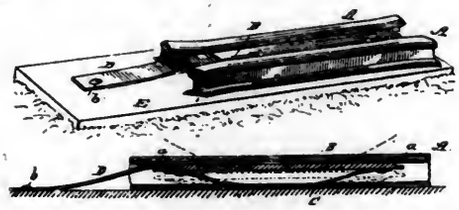
Claim.—1. The combination of the car with sections of flooring which are placed in the ends of the car, and the section of flooring which is placed at right angles thereto, each section being composed of the perforated



cross-bars I and the slats J, and the car being provided with the ventilating-openings F B below the level of the sections, substantially as shown. —2. The car A, provided with the ventilating-holes B F, combined with the sections of flooring, arranged at right angles to each other, and provided with the perforated cross-pieces I and the side sections or lattice-work P, substantially as set forth.

294,598. RAILROAD FROG AND SWITCH GUARD: Philip S. Dusenbury, Sedalia, Mo., assignor of one-half to W. Z. Baum and A. H. Randall, both of same place.

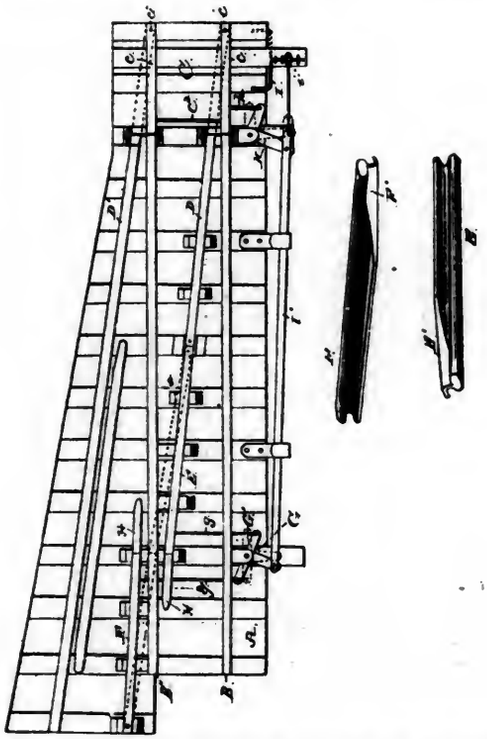
Brief.—A plate provided with shouldered ends and a longitudinal side flange placed between the rails and supported by a spring.



Claim.—1. In a guard for railway-crossings and switch-frogs, the strap D and the plate B, provided with shouldered ends and longitudinal flanges *d*, said plate being placed between the rails and supported by a spring, C, substantially as and for the purpose set forth.—2. In a guard for railway crossings and switches, the combination, with the plate having the end shoulders, *a*, and longitudinal flanges *d*, of the spring C and the strap D, secured at one end to the bed-plate, the opposite end resting on a shoulder of plate B, substantially as and for the purpose set forth.

294,664. RAILROAD-FROG: John F. Penrod, Derry, Pa.

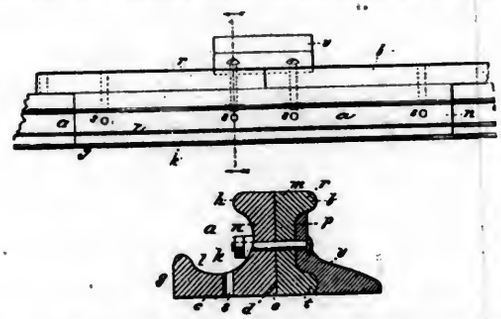
Brief.—A railway-crossing in which the main rail is unbroken and the movable cross-over rails are protected by fixed sections of rails which register with them when they are not in use.



Claim.—In a railway-crossing, substantially as described and shown, the combination, with the unbroken main-line rail and the pivoted movable rails E F, of the protecting rails or sections H H, secured on the track in position to register with the movable ends of the rails E F when the latter are adjusted away from the fixed rail, substantially as described, and for the purposes set forth.

294,743. REVERSIBLE SECTIONAL LAP-JOINT RAILWAY-RAIL: Hansford D. Norrell, Richmond, Va.

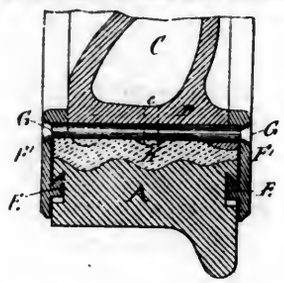
Brief.—A railway-joint consisting of two rail-sections—one L-formed, the other I-formed—with half-heads, the sections being reversible.



Claim.—1. The L-form railway-rail section having plane faces meeting at right angles to each other, and half-heads arranged, respectively, in vertical and horizontal position, substantially as specified.—2. A lap-joint railway-rail composed of the reversible L-shaped sections *a*, the reversible I-form section *b*, the coupling-plates *v*, and coupling-bolts, substantially as specified.

294,750. CAR-WHEEL: Anson Atwood, Dunellen, N. J., assignor to the Atwood Hemp Car Wheel Company, New York, N. Y.

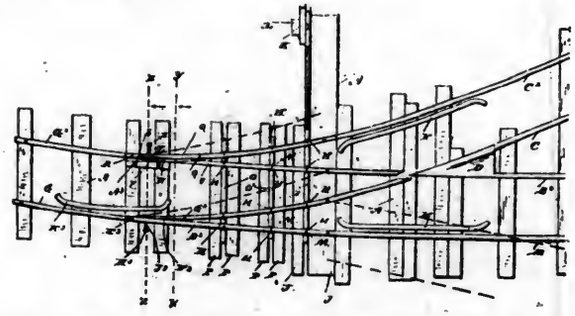
Claim.—1. The combination of an elastic packing K, with the tire A and rim D, having corresponding corrugations or roughenings upon their adjacent faces so shaped as to lock the tire against both lateral and rotary slip on the wheel, substantially as described.—2. The combination of the rim D, tire A, and elastic packing, with their circumferential corrugations, with the loosely-engaging tongue and groove upon the tire, and flange or ring, and with suitable means for preventing rotary slip, substantially as described.—3. The combination of the tire A, rim D, packing K, flange F or ring, or rings F', loose tongue-and-groove lock E, and bolts G, having no metallic contact with tire or rim, substantially as



described.—4. The combination of the tire A, rim D, packing K, flange F or ring F', lock E, and bolts G, passing through grooves in the rim, with the lip *g*, substantially as described.—5. The combination of the tire A, rim D, packing D, rings or flange F F', lock E, bolts G, and keys H, substantially as described.—6. The compound of fiber and vaseline for packing railway-car wheels, substantially as described.—7. A car-wheel having the separate tire and a body cast in one piece, consisting of the hub and rim, with the intermediate double-arched portion, having sand-holes from the inner arch through the hub and from the outer arch through the rim, and with unperforated sides, substantially as described.—8. In a wheel having a tire, A, capable of yielding radially to thrust or jar, the combination of the body, tire, and a loose tongue-and-groove lock E, connecting the tire to the body, substantially as and for the purpose described.

294,904. RAILWAY-SWITCH: William W. Pennell, Nashville, Ohio.

Brief.—The two point or inner rails of the main and siding switches are secured to outer pivoted rails of said sections, the siding-point being secured by a spring-bolt to yield to the wheel-flange. The other point is formed with a groove for wheel-flange and bolted to a correspondingly-grooved block, the adjacent pivoted rail being cut away to receive the tapered end of the grooved point-rail. The vibrating ends of the switch-rails rest in beveled seats in shifting blocks, one of which is connected with an operating-lever. In the normal position of the tracks the main is closed to trains facing the points, while movement in the opposite direction from either track is permitted.

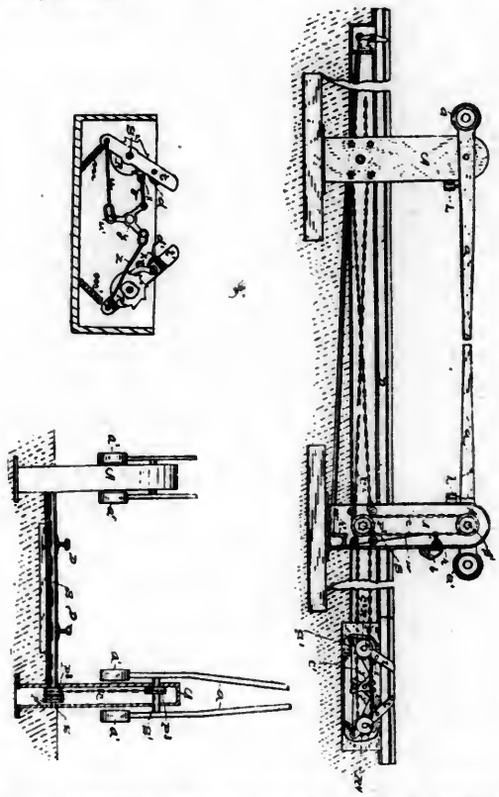


Claim.—1. The combination of the main track and sidings, the continuation of the main track, the rails Q and D of the switch, pivoted at their ends adjoining the continuation of the main track, the rail U, having one end connected to the rail Q and cut down at W, the block or plate A, having the groove C, the rail G, connected to the pivoted end of rail D by spring mechanism, and the sliding blocks or chairs for carrying the rails of the

switch and retaining them in position, substantially as and for the purpose set forth.—2. The combination, with the main track and sidings, of the switch, comprising the rail Q, pivoted at R, and formed with the beveled notch S, the rail U, tapered at its end V to correspond to said notch S, and having this tapered end cut down at W, devices securing these rails together, the rail D, pivoted at E, the rail G, having the beveled end F, the spring-actuated bolt H, for securing these rails together, the plate A, having the groove C, and the sliding blocks having the recesses that receive the ends of the rails of the switch to operate and retain the same in position, substantially as and for the purpose set forth.

294,765. RAILROAD-CROSSING GATE: Joseph Coty, Joliet, Ill.

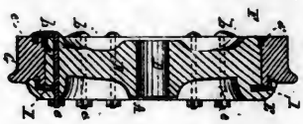
Brief.—A railroad-gate worked by levers operated upon by the tread of the car-wheels. The levers carry ratchets, and are returned to their normal position by springs. Through sheaves, chains, and Y-shaped piece connected to the levers the successive wheels of the train lower or raise the gate-bars gradually.



Claim.—The combination of the gate-bars *a*, shaft S', sheaves P P P, chains *c c c'*, posts A, levers *t t'*, links *z v w*, Y-shaped piece *y*, springs *m m'*, ratchets R R', pawls *x x*, rock-shafts S R, and sheaves P P', all arranged to operate substantially as and for the purpose set forth.—2. The combination of the levers *t t'*, pawls x x, ratchets R R', links *z v w*, coil-springs *m m'*, sheaves P P', Y-shaped piece *y*, and chains *c'* c, by means of which successive wheels of the approaching train lower the gate-bars *a a*, or elevate them, gradually, in the manner and for the purpose set forth.

294,890. CAR-WHEEL: William I. Lindsay, Cleveland, Ohio.

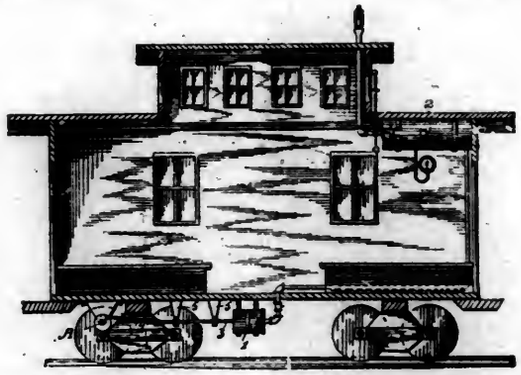
Claim.—1. The body and tire of the wheel, provided with the interlocking tongue and grooves, in combination with the bolt passing through the body, and provided with the pin for engaging the tire and with the nut for securing the parts together, substantially as and for the purpose set forth.—2. The body of the wheel, provided with the angle-iron, and with the annular tongue and groove for engaging the corresponding tongue and groove formed in the tire, in combination with the bolt and pin for engaging the body and tire, substantially as and for the purpose set forth.—3. The body and tire of the wheel, provided with the interlocked tongue and groove, in



combination with the dowel-pin for engaging the adjacent faces of the body and tire, and the bolt and pin for securing the parts together, substantially as and for the purpose set forth.—4. In combination with the sections A B of the herein-described car-wheel, the dowel-pins *a'* and bolts *c* and re-enforcing angle-irons, substantially as and for the purpose set forth.

295,144. CAR-SIGNAL: William D. Beaty, Mannington, W. Va.

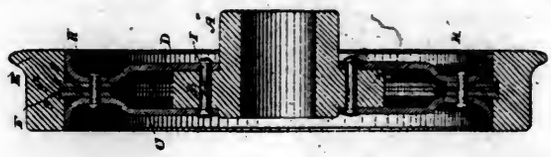
Claim.—1. In a signal-car, and in combination with the alarm thereof, the shaft A, secured beneath the car, provided with friction-wheel B, adapted to bear on the axle, and having a crank-turn, to which is secured the piston-rod of an air-pump, 1, which forces air into a reservoir, where it is held under pressure for subsequent use, the lever O, pivoted within the car, and connected to the end of the shaft A by the link *b*, and held in any desired position by the serrated plate *c*, substantially as described.—2. In a car-signal, and in combination with the alarm thereof, the shaft A, secured beneath the car, provided with friction-wheel B, adapted to bear on the axle, and having a crank-turn, to which is secured the jointed piston-rod of an air-pump having valved piston-head, said air-pump being secured to the bottom of a car, and adapted to force air through connecting-pipes into a reservoir, 2, and means for raising, lowering, and holding in place the shaft A, consisting of the lever O, pivoted inside the car, and connected to the end of the shaft A by link *b* and plate *c*, for holding the lever in any desired position, substantially as described.—3. In a car-signal, the combi-



nation of the shaft A, secured beneath the car by the hangers *a a'*, the latter of which is slotted, as described, having the crank-turn, to which is secured the jointed piston-rod supported by the hangers 5, the air-pump 1, secured beneath the car, reservoir 2, whistle, connecting-pipes, and the lever O, pivoted within the car, and connected to the shaft A by link *b*, and held in place by serrated plate *c*, all substantially as described.

294,995. CAR-WHEEL: John A. Hagan, Three Rivers, Mich., assignor, by mesne assignments, to the Hagan Steel Car Wheel Company, same place.

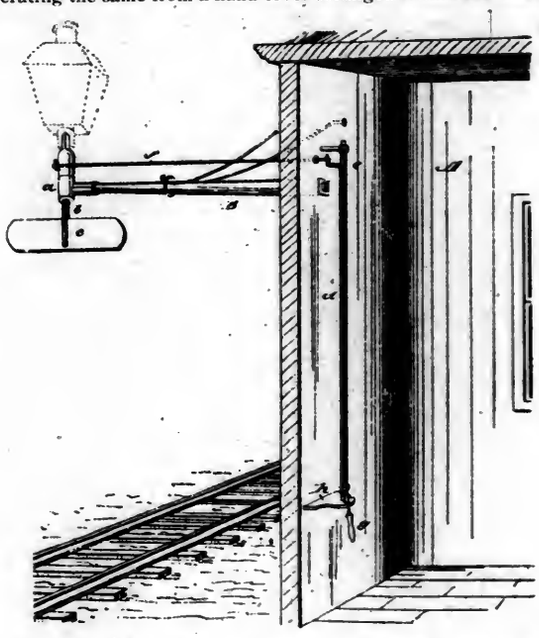
Claim.—1. The combination, with a tire for a car-wheel having a dovetail annular groove in its inner face, of a sectional dovetail ring secured in such groove, substantially as set forth.—2. The combination, with a hub of a car-wheel and its tire provided with a sectional dovetail ring, of side plates or disks pressed between the hub and tire and bolted to the hub and



ring, substantially as set forth.—3. In a car-wheel, the combination, with a hub and tire provided with a sectional dovetail ring, of side plates or disks having flanged rims, and bolted to the hub and ring, substantially as set forth.—4. In a car-wheel, the combination, with a hub and a tire provided with an internal sectional dovetail ring, of side plates or disks with rims curving outwardly from the depending flange, and bearing against the tire, and bolted to the ring and hub, substantially as set forth.

295,264. RAILROAD-SIGNAL: John Mayne, Atchison, Kans.

Brief.—This device embraces a signal supported near the track by a bracket fixed to the outside of the station-building, and means, as described, for operating the same from a hand-lever arranged within the building.



Claim.—In a railroad-signal, the combination, with the support B, having an upright box, *a*, at its outer end, and the vertical shaft *d*, bearing in a notched plate, *h*, at its lower end, and having a pivoted handle *g*, of the shaft *b*, passing through and supported upon the box *a*, and carrying the board *c* and a lamp, and the rod *f*, connected to the shaft *b* and to a crank, *e*, of the shaft *d*, substantially as and for the purpose set forth.

The Hunter Locomotive Spark Arresters.

WE present herewith drawings and explanation of a Locomotive Spark Arrester, which, though comparatively a recent candidate for favor in this field, has already proved itself a practical success.



THE HUNTER LOCOMOTIVE SPARK ARRESTERS.

The particular points of excellence claimed for this device are:

The arrest of all cinders and sparks and deposit of them in a convenient receptacle, where they are immediately extinguished; so that they may be dumped on any portion of the track, while the train is running, without danger of firing ties or stringers.

An equalization of the draft, which compels each flue to do its proper share of work, and thus reduces the necessity of cleaning them.

The reduction of cost for repairs to the minimum, as there are no wire screens to wear and burn out.

Convenience of arrangement for repairs when needed. By opening the door of the smoke box, immediate access to steam pipes, tubes, etc., is had.

By reason of the peculiar construction of the exhaust confining tubes, a larger exhaust orifice is admissible; and this combination tends to create a vacuum in the vicinity of the open joints of the exhaust tubes, which is commensurate with the steam pressure in the cylinders. This, in connection with the supernumerary exhaust nozzle—or spark jet—reduces the back pressure in the cylinders, due to exhaust resistance, to the minimum, thus allowing the engine to work free.

Reduction in cost of fuel, which is verified by the following statement, taken from record books of the Vandalia line:

MONTH OF NOVEMBER, 1883.

No. Eng.	T's Coal.	Miles Run.	Car Miles.	Car miles per ton of Coal.
44	135	4,110	39,940	295.8
179	164	3,698	42,478	259.
180	177	3,348	39,147	221.1

These engines hauled the same train, during the month. No. 44 was equipped with the Arrester and Extinguisher. Engines 179 and 180 are of the extended smoke box type.

In attaching this device to the ordinary locomotive, no extension of the buffer beam is necessary, unless it is desired to use a very large cinder receptacle; the ordinary size being competent to carry a box which will hold thirteen bushels.

The invention, the use of which has been found so valuable, is manufactured by the Hunter Locomotive Spark Arrester Company, Terre Haute, Indiana. We append three letters containing statements which strongly present the advisability of its adoption:

TERRE HAUTE, IND., Jan. 25, 1884.

Geo. D. Hunter, Esq., Supt. Hunter Spark Arrester Co.:

DEAR SIR:—In answer to your inquiry as to what satisfaction your Spark Arresters are giving, will say that we have now two in use—one on a light passenger engine 15x22, the other on one of our heaviest passenger engines 18x24, pulling heavy passenger trains, consisting of from ten to fourteen cars, at an average speed, including stops, of thirty-two miles per hour. The arrangement of the parts in the front end is very convenient, allowing free access to the flues and steam pipes. I consider the Spark Arrester as a whole a great improvement over the old "Diamond Stack," throwing no fire, clean to ride after, and steaming well.

Yours truly,
G. H. PRESCOTT,
Supt. M. P. & M.

TERRE HAUTE, IND., Feb. 5, 1884.

Mr. Geo. D. Hunter:

DEAR SIR.—I fully concur in the opinion which Mr. G. H. Prescott, Supt. Motive Power of this Line has given in regard to the merits of your Spark Arrester, and I say that I know of no better arrangement in use for effecting the purpose for which it was designed. I have been cognizant of the experiments you have made from the inception of this device to its latest improvement, and have formed my opinion from my own observations as well as from the testimony of the men who have handled the engines.

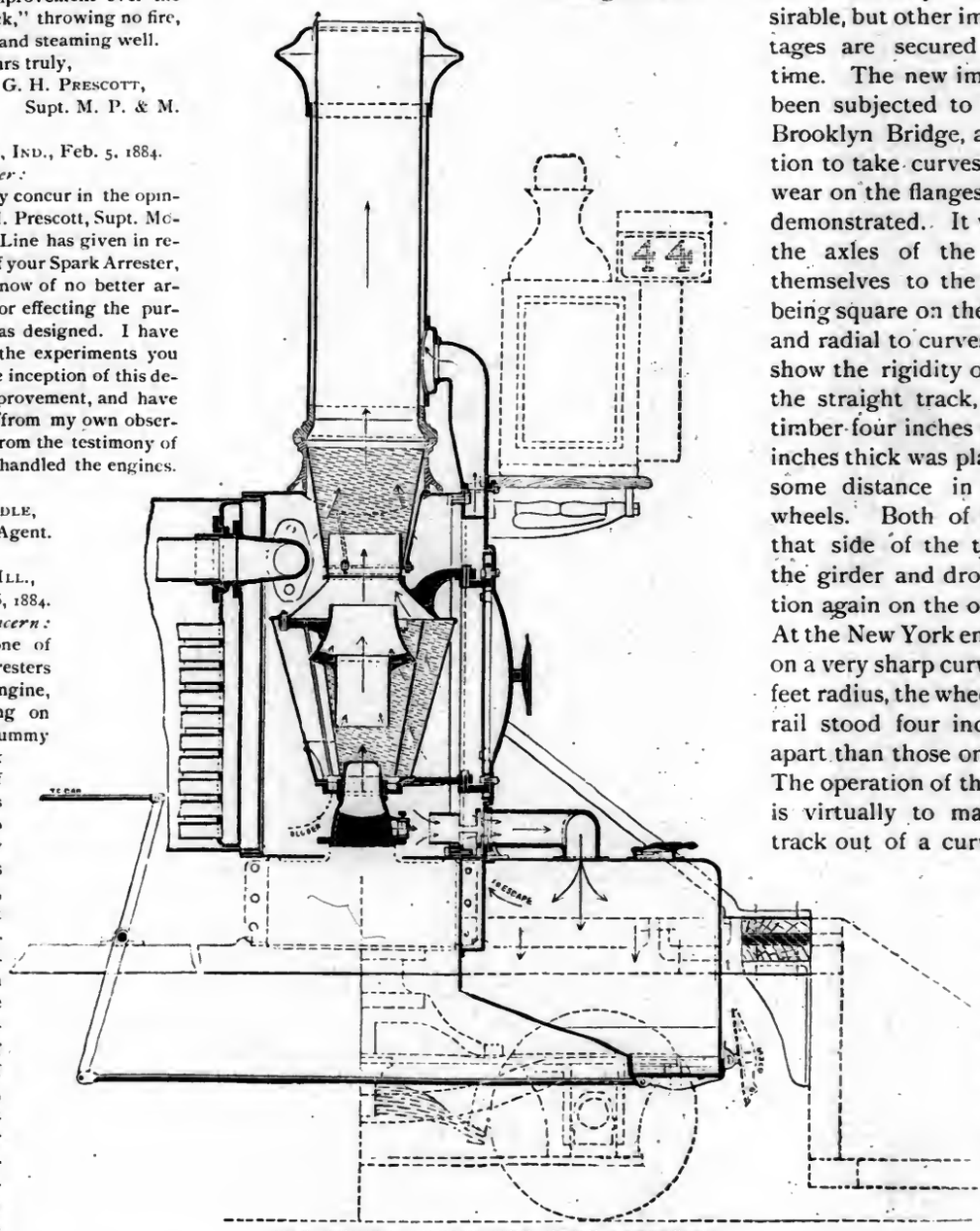
Yours truly,
CHAS. R. PEDDLE,
Pur. Agent.

DANVILLE, ILL.,
Feb. 6, 1884.

To whom it may concern:

We are using one of Hunter's Spark Arresters and Stack on our engine, 2, which is running on what is termed a dummy train, cylinders 15x22, hauling part of the way three cars and balance of trip five, distance fifty miles, in two hours and fifteen minutes, making thirty-eight and forty stops. Although not considered perfect when put on we notice quite a saving in fuel, engine making steam freely, (using words of Engineer, cannot run her out of steam) doing her work easy on account of large nozzle, and the great comfort of not having cinders back on the train. I consider it far ahead of the Diamond stack with cone netting and petticoat pipes. As regards all things in connection with the engine repairs the same from August to date have been one dollar and fifty cents, no material used. We intend to put on more of them as soon as we can. Ahead of all other devices in access to front end to make repairs.

ALLEN COOK, M. M. C. & E. I. R. R.



THE HUNTER LOCOMOTIVE SPARK ARRESTERS.

THE plan of using the enormous water power of the Alps for working electric railways in Switzerland appears to have taken a definite shape, the idea being to connect the towns of St. Moritz and Pontresnia by an electric railway four and three-fourths miles long, the motive power to be supplied by the mountain streams. the line, in case the plan proves a success, to be extended a considerable distance.

The American Radial Truck.

A TRUCK is made by the American Radial Truck Company, corner Atlantic and Third avenues, Brooklyn, New York, by means of which not only is assured the practicability of trains running in circuit, continuously on the same line of rails, to save cross-over switches, where such an arrangement of terminal tracks may be found to be desirable, but other important advantages are secured at the same time. The new improvement has been subjected to a trial on the Brooklyn Bridge, and its adaptation to take curves without extra wear on the flanges of the wheels demonstrated. It was found that the axles of the trucks adjust themselves to the line of travel, being square on the straight track and radial to curves. In order to show the rigidity of the axles on the straight track, a piece of oak timber four inches wide and three inches thick was placed on one rail some distance in front of the wheels. Both of the wheels on that side of the truck mounted the girder and dropped into position again on the other side of it. At the New York end of the bridge, on a very sharp curve of but ninety feet radius, the wheels on the outer rail stood four inches further apart than those on the inner rail. The operation of the Radial Truck is virtually to make a straight track out of a curve; the flanges of the wheels binding the inner edges of the rail in passing a curve no more than they do upon a straight track.

In the ordinary car truck there is but one point of attachment to the car body, namely that at the king-bolt center; in the Radial Truck there are two bearing surfaces and points of control. These are, first, on the forward pair of wheels of each truck, on which is a fifth-wheel attachment; and, second, over the second pair of wheels, where is a sector attachment. The radial device has transverse bars running diagonally from a frame work, the points of attachment being near to the inner plane of the wheels. On a straight track the rigidity of the entire car body tends to hold the trucks straight, and prevents them from getting out of a straight line; in the Radial Truck the controlling point of attachment of the car body

is at the fifth wheel, and this is placed immediately under the end sill of the car. From this attachment at the extreme end of the car a better control of the car body is obtained than is the case with the ordinary standard truck, the overhanging weight from the king-bolt center to the end of the car being done away with.

The American Radial Truck was invented by Walter Youmans, No. 169 West Tenth street, New York city. Wm. J. Richardson is manager for the company, at the address given in the first paragraph.

The Economy Oil Can.

THE Economy oil can, figured here, is intended to take the place of the ordinary can used in oiling machinery, and consists of a common can with a funnel-shaped attachment which, when the can is in use, rests like a cap on the top of the can, and is itself surmounted by a small rubber ring, which becomes a cup when slid down upon



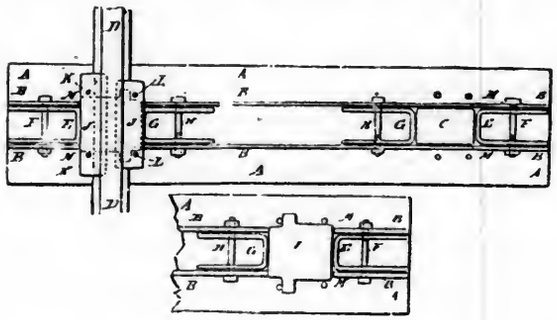
the funnel and protects the fingers of the operator from the oil. When it is desired to fill the can from a bottle or other vessel, the nozzle is unscrewed, the funnel slipped off and inserted in the top of the can, and the oil poured through it. Loss or spilling of oil is completely prevented, and when the can is full, the funnel is readily removed and slipped over the top of the nozzle down upon the can, followed by the rubber ring. The whole is kept in place by its close fit and by the rubber ring, which counteracts any tendency to work loose. In point of cleanliness as well as economy, the Economy oil can is a marked improvement upon the old form. The inventor is James H. Brown, of Ottawa, LaSalle County, Illinois.

Van Orden's Metallic Railroad Tie.

CHARLES VAN ORDEN, Catskill, New York, has been granted United States letters patent on his improvement in metallic railroad ties. The object of his invention is to provide metallic ties for railroads, constructed in such a manner as to be economical and trustworthy in use, and which will allow the rails to be taken up and replaced without disturbing the ties, and the blocks or cushions to be taken out and renewed without disturbing the ties or rails.

It consists of a metallic railroad tie constructed, with a base plate having parallel flanges, and blocks placed between the flanges to support the rails, and kept in place by U-shaped bars secured to the parallel flanges. Upon the tops of the rail-supporting blocks are placed plates, to prevent the rails from wearing the blocks. Upon the end parts of the flanges of the base plate are formed shoulders for the outer edges of the rail chairs to rest against, to prevent the rails from spreading.

To describe it more particularly: The base of the tie is made wide to prevent it from being pressed into the road bed. Upon the opposite sides of, and equally distant from the central line of the base plate are formed, or to it are attached, two parallel flanges, between which are placed blocks of paper or other suitable material, made of such a thickness as to rise a little above the upper edges of the flanges, to serve as cushions to the rails and to prevent them from resting upon the flanges. The blocks are kept from moving outward by U-shaped bars placed between



the flanges, with their bends resting against the outer ends of the blocks, and the arms of which are secured detachably to the flanges by bolts or keys. The blocks are kept from moving inwardly by U-shaped bars placed between the flanges, with their bends resting against the inner ends of the blocks, and which are secured in their places by rivets passing through them and through the said flanges. The bases of the rails rest upon the wear plates placed upon the blocks, and are kept in place by chairs, which can be made in two pieces or in any other suitable manner. The chairs are secured in place by bolts, some of which pass up vertically through the base plate and the outer parts of the chairs, and the others in inwardly inclined directions through the base plate and the inner parts of the chairs. The outer edges of the chairs rest against shoulders formed upon the outer parts of the flanges to hold the rails from spreading. The wear plates are kept from moving upon the blocks by shoulders and the bolts before mentioned. With this construction, by loosening the nuts of these bolts and removing the bars, the cushions can be removed through the outer ends of the ties without disturbing the ties.

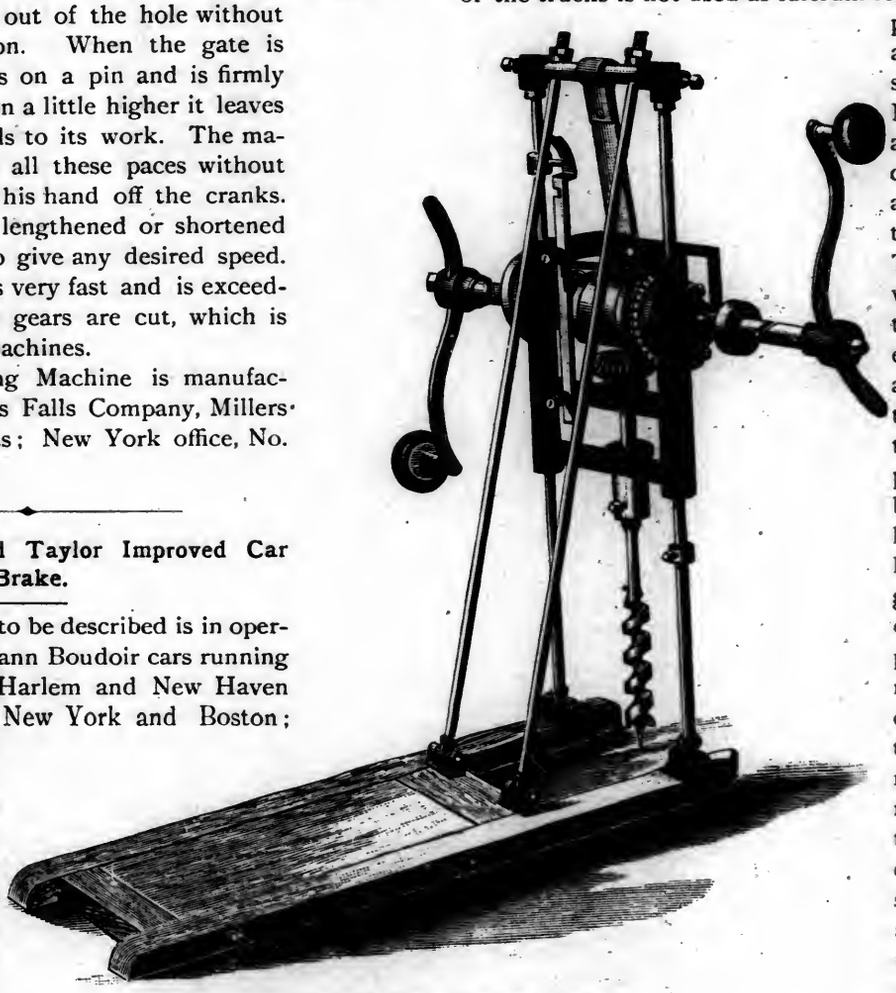
DEAN BROS. Steam Pump Works, Indianapolis, have recently received orders for their independent air pump and condenser, from the Logansport, (Indiana) Electric Light Company; Clinton (Iowa) Water Works; Yaeger Mill Company, Kane, Illinois, and Brush Electric Light Company, Indianapolis. Dean Bros. are getting out patterns for a new line of duplex pumps.

IT has been found that the tractive force, or friction, between the wheels of a car and the rails on an electric railway is increased twenty per cent. when the current is put on—that is to say, the electric current passing from the rails, as conductors, to the metal wheels of the cars, on its way to the electric motor, actually increases the grip of the wheels by this amount.

Carpenter's Boring Machine.

THIS improvement, to which reference was made in the March number and of which we are enabled to present an illustration, is built of steel, with steel braces. The upright rods (one-half inch in diameter) pass through the auger gate, which slides up and down on them, and can by no possibility fly the track. By the half turn of a set-screw the frame can be adjusted so that the auger will bore at any desired angle. When the right depth is reached, the auger comes to a full stop; the next turn in the same direction loosens the screw; then it falls into gear, and is drawn out of the hole without changing the motion. When the gate is drawn up it catches on a pin and is firmly held, but when drawn a little higher it leaves the pin and descends to its work. The machine goes through all these paces without the operator taking his hand off the cranks. The cranks may be lengthened or shortened at pleasure, so as to give any desired speed. This machine works very fast and is exceedingly durable. The gears are cut, which is not usual in other machines.

Carpenter's Boring Machine is manufactured by the Millers Falls Company, Millers Falls, Massachusetts; New York office, No. 74 Chambers street.



CARPENTER'S BORING MACHINE.

The Van Wie and Taylor Improved Car Brake.

THE brake about to be described is in operation on the two Mann Boudoir cars running on the New York, Harlem and New Haven Railroad, between New York and Boston; also on the car built for Adelina Patti, belonging to the same company. It is giving satisfaction. The manufacturers are the Van Wie and Taylor Brake Company, Troy, New York.

A plan of the device shows a Westinghouse air cylinder, and an angular arm put on the piston of the air cylinder, and having a hole long enough to admit a rod passing through it to work freely; said rod has a fixed collar. A guide allows an extension on the angular arm to pass through it, so that the side draw cannot bend the piston rod out of cylinder. The segment of toothed levers attached to the rod passing through the angular arm, meshes in with a gear having a chain pulley underneath, which is cast in one piece. On both the top and bottom of the teeth a flange is cast, projecting out to the point of tooth, so that it forms a guide for the toothed levers before mentioned, and also provides that the teeth cannot be broken out of gear or the levers get out of mesh. Rods going to the truck levers have a piece of chain on the end, which winds around a pulley. Levers standing perpendicularly at the back end of the truck are hung to the spring plank by a movable fulcrum which slides backward or forward, equalizes the wear of the brake shoes, and also applies an equal pressure to all wheels at the same instant. Rods connect the perpendicular levers at the back end of the truck, by an eye-bolt, and play when the spring plank oscillates. The eye-bolt is provided with a nut which takes up the slack or wear of the brake shoes, and adjusts them to the wheels.

It is claimed for the brake, described in as perfect a manner as the absence of a cut makes possible, that it will not slide the wheel under any circumstances, because one of the trucks is not used as fulcrum for the other, but the power is applied on all the wheels instantaneously. Moreover, jarring and jerking are claimed to be done away with by use of the Van Wie and Taylor brake, whether applied to the wheels of a train either by hand or air. Other advantages claimed are that it weighs 150 pounds less than the brake now in use, having no double levers and lever guides in trucks; it does not need repairing; the piston rod of the air cylinder cannot bend if taking up brakes is neglected; it is not necessary to adjust the brakes but once during the life of a set of brake shoes, and only two minutes to a car are required to adjust them; and the brake shoes are worn equally, so that when one is worn out the whole set needs to be changed.

CAR coupler inventors, says the *Railway Age*, will be encouraged to know that the Massachusetts house has finally passed a bill which provides as follows:

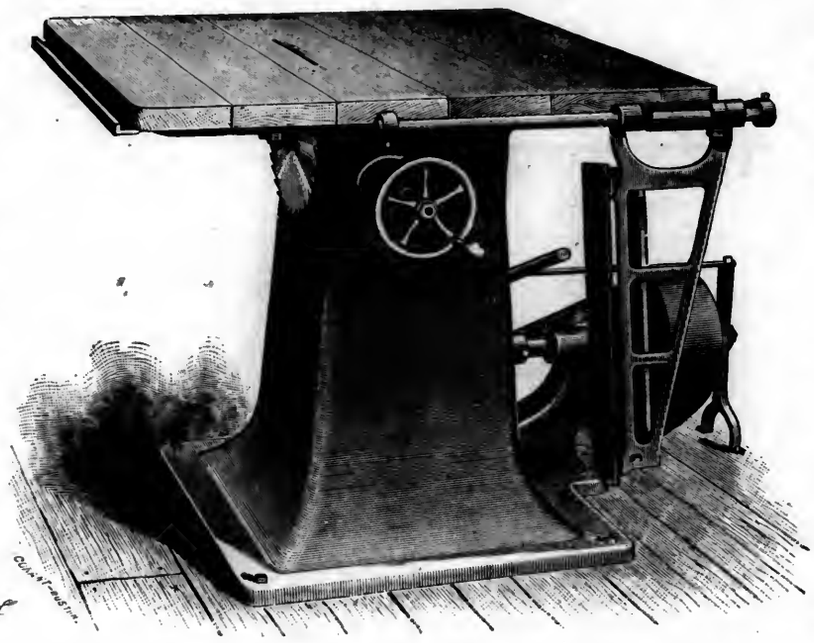
Every railroad company operating a railroad or any portion of a railroad, wholly or partly within the state, shall place upon every freight car hereafter constructed or purchased by such corporation, and upon every freight car owned by such corporation of which the coupler or drawbar is repaired by it with intent to use such car, such form of automatic or other safety coupler at each end thereof as the board of railroad commissioners may prescribe.

THE Schenectady Locomotive Works have recently received an order for ten locomotives from the Wisconsin Central for use on the extension of that road from Chippewa Falls to St. Paul.

The H. G. Saw Bench.

AS INDICATED by the cuts, the principal features of this saw bench, made by Hobbs, Gordon & Company, Concord, New Hampshire, are its simplicity and compactness. It does not require more than one-half the ordinary amount of floor space, and is found to be a most efficient and convenient tool, easily managed, and very durable.

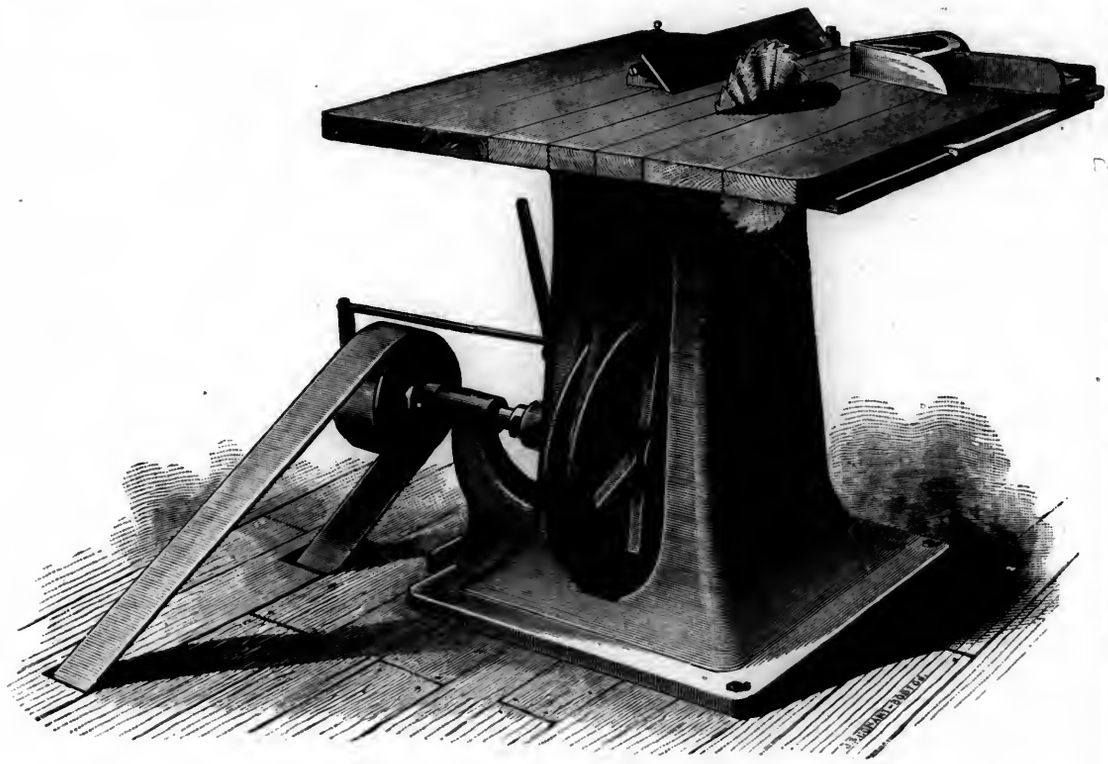
The frame of the H. G. Saw Bench consists of a hollow pedestal, cast in one piece, upon which is fastened the table, made either of wood or iron. A pivot joint is used to fasten the frame and table together, allowing the latter to be readily raised when the saw has to be changed, oil has to be applied, or for other purposes. Unlike most saw benches, the counter-shaft and pulley which drive the arbor, instead of being several feet from the base of the machine, are directly under and running in journal boxes cast to frame. This is readily accomplished by means of the manufacturers' method of transmitting power from one shaft to another, a method which also provides that the saw arbor can be raised or lowered, with hand wheel and screw arrangement, without changing the tension of the belt, at the same time also obtaining a large increase of power over the old way. For driver, the manufacturers use their patent self-lubricating pulley, which has been found to be perfectly sure and trustworthy in all respects. They also use their improved guides and rests for splitting, squaring, and mitering.



THE H. G. SAW BENCH.

THE Union Car Coupler Co., of No. 19 Congress street, Boston, Mass., whose patent is now being successfully used by the Eastern and the Boston and Maine railroad companies, has secured a contract for furnishing their coupler to the Maine Central railroad.

IN the Steam-cylinder Lubricator invented and patented by Washington L. Parker, of Chicago, the oil is forced from its chamber by hydrostatic or other pressure, and delivered in drops at one end of a vertical or horizontal glass tube, through which it is carried by and with an active current of water from the condenser.



THE H. G. SAW BENCH.

The Lake Shore and Michigan Southern Railway Co.

Treasurer's Office, Grand Central Depot,
NEW YORK, March 28, 1884.

THE BOARD OF DIRECTORS OF THIS COMPANY have this day declared a QUARTERLY dividend of TWO PER CENT. upon its capital stock, payable on THURSDAY, THE FIRST DAY OF MAY NEXT, at this office. For the purpose of this dividend, and also for the annual meeting of the stockholders, for the election of Directors, etc., which is to be held on the 7th day of MAY next, the transfer-books will be closed at 3 o'clock P. M. on THURSDAY, the 3d day of APRIL next, and will be repened on the morning of FRIDAY, the 9th day of MAY next.

E. D. WORCESTER, Treasurer.

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Rolling Stock Company,

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WORKS—Chicago, Ill., and Urbana, Ohio,

Offers for Lease to Railroads, Freight Lines, Mining Companies and others,

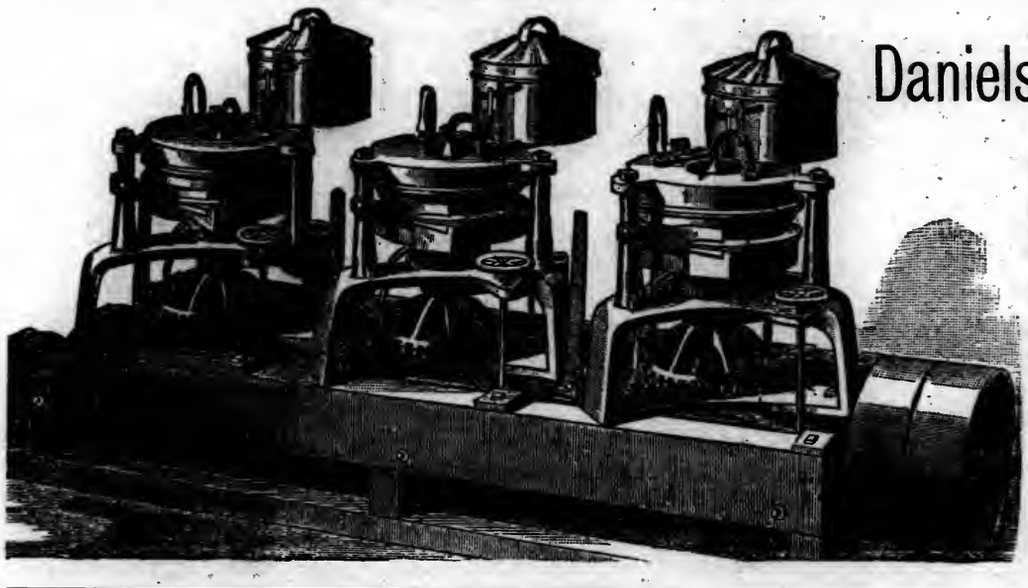
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And is also prepared to build for Lease and

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Such Rolling Stock of every description as may be required.

A. HEGEWISCH, Pres't.



THE

Daniels Paint Mills.

The cut represents three mills on one bench, all driven by one belt; the stones are cooled with water expressly for grinding Coach Colors in Japan and Varnishes. The larger sizes are especially adapted for grinding car and all fine oil colors.

These Mills are now in use by nearly all the large manufacturers in the United States and Canada.

I also build a variety of Mills for the more common paints both dry and in oil. These common Mills are without the cooling appliances.

WILLIAM DANIELS,
Patentee and Sole Manufacturer,
55 Atlantic Avenue,
BROOKLYN, N. Y.

JUST PUBLISHED.

A New System of Laying Out Railway Turn-Outs Instantly, by Inspection from Tables.

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16mo. Price, $1.

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VANDERBILT & HOPKINS,

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Creosoted and Treated Lumber and Ties, Pine Boards, Plank and Dimension Lumber to Order.

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NATIONAL TUBE WORKS CO.

Manufacture Wrought Iron Pipes and Tubes.

National Special Semi-Steel LOCOMOTIVE Tubes.

WORKS: McKEESPORT, PENN.; BOSTON, MASS.

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Vehicles for Town and Country, for Gentlemen's and Ladies' own driving.
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Rubber Cushioned Axles used exclusively.

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This signal has been fully tested on the New York and New England Railroad at Dudley and Bird Streets, by practical operation, and has proved a complete success, to the entire satisfaction of many prominent Railroad men and experts who have watched and examined it. It provides an Automatic Block, Crossing, Station, Switch, Bridge, Yard and Curve Signal, Gate and Revolving Lanterns. Being operated by the weight of trains passing over an incline bar, forcing common air through a tube by means of a bellows, it is positive in its action, and is highly commended by all railroad officials who examine it. The company can shortly fill orders to place it on any railroad, and invite communication from Railroad Officials from all parts.

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is the name of a new Blasting Powder, formed by the union of two ingredients—one a solid and the other a fluid—both being absolutely INEXPLOSIVE until COMBINED by the consumer.

These ingredients are positively safe to transport and handle, do not freeze in cold climates, exceed in strength the dynamites, and contain no glycerine, nitro-glycerine or gun cotton. Made by the

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ALSO BLASTING BATTERIES, FUSES, CAPS, ETC. SEND FOR CIRCULARS.

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OLDEST BRUSH HOUSE IN AMERICA.

WILLIAM WALL'S SONS,

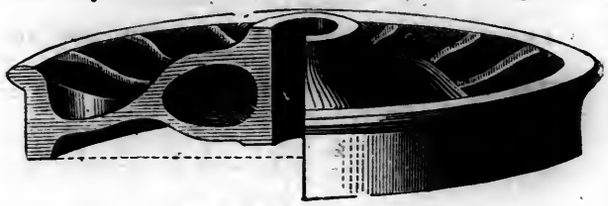
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ITALIAN HEMP PACKING, RUSSIA HEMP PACKING, AMERICAN HEMP PACKING, BELL CORD.

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Ramapo Wheel and Foundry Co.,



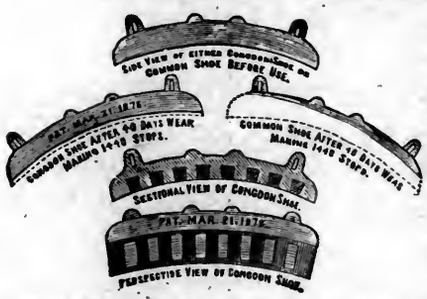
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For Drawing-Room and Sleeping Coaches, Locomotives, Tenders, Passenger and Freight Cars.

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RAMAPO, Rockland Co., N. Y.

CONGDON BRAKE-SHOE.



This improvement consists of a brake-shoe having imbedded in its body of cast-iron, pieces of wrought iron, steel, malleable iron, or other suitable metal, and while being more effective, in that greater uniformity of friction is obtained when applied, exceeds in life, or the duration of the shoe itself, that of the cast-iron shoe by over *seventy-five* per cent. Its extensive use on many of the most prominent roads in the country has proven its economy and superiority over any other shoe in use. All communications should be addressed to

THE CONGDON BRAKE-SHOE CO., 246 Clark St., Chicago.
or, RAMAPO WHEEL AND FOUNDRY CO., Ramapo, N. Y.

Ramapo Iron Works

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Extracts from Testimonials.

We have used Le Page's Fish Glue for about two years with increasing favor, and find it to do very good and reliable work.
Mason & Hamlin Organ and Piano Co., Boston, Mass.

The glue purchased from you is the best we have ever used for pattern making, and similar purposes. By mixing it with ordinary glue to give it more body, we have used it successfully on our emery belts.
Noxon Bros. Mfg Co., Manufacturers Agricultural Implements, Ingersoll, Ont.

The sample of glue sent us was thoroughly tried and tested, and found to be excellent in every respect.
Jno. Bailie, Supt. Car Dept. C. M. & St. P. R'y, Milwaukee, Wis.

We have used your liquid glue for about eight months, and find it very much superior to the common glue, for nearly all kinds of work.
The Williams Mf'g Co., Mf'rs Sewing Machines, Montreal, Canada.

Gave glue water test; unable to break joint after three and one-half hours. Think it what you represent it to be.
Wm. Sutton, Supt. Brownell & Wight Car Co., St. Louis, Mo.

Sold in bbls., kegs, cans and bottles, by Railroad supply and Hardware dealers throughout the world. Manufactured by

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DEVLIN'S

Improved Car Coupling.

Patented in Canada, Oct. 15th, 1883.
In the United States, Jan. 8th, 1884.

PATENT IS FOR SALE OR TO LET ON ROYALTY.

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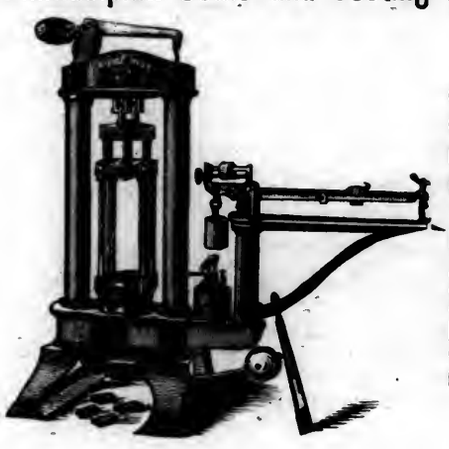
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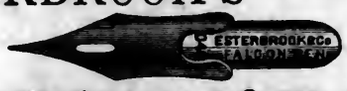
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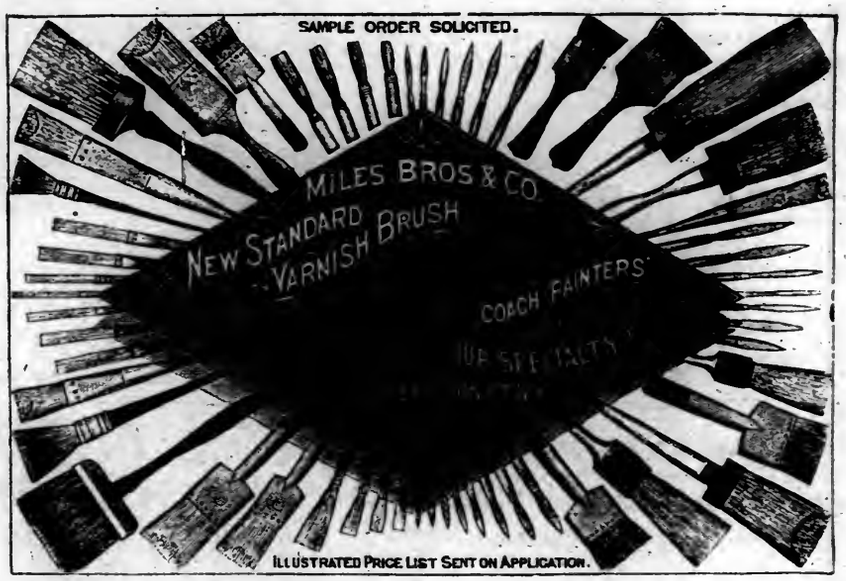
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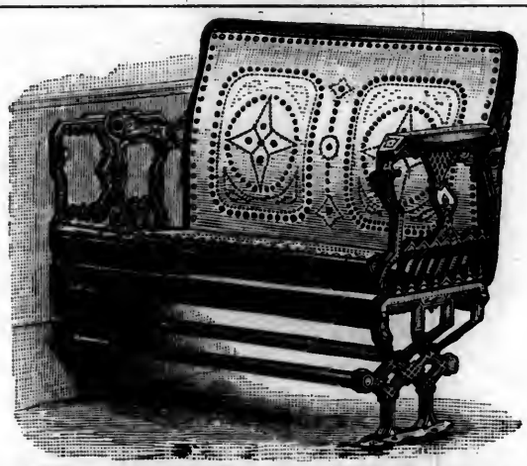


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NEW YORK, MAY, 1884.

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BULLION.

ONE of the most noted recent contributions to the ever increasing volume of financial literature is a series of articles prepared by Mr. I. W. SYLVESTER, of the United States Assay Office in this city, in which he presents arguments in favor of "bullion certificates."

According to his proposed system, gold and silver bars are to be deposited with the government, who will in return issue certificates to the depositors, which certificates are to be redeemable on demand, and legal tender, and thus will logically become the national currency. This, in brief, is Mr. SYLVESTER'S project, and it is presented with much cogency and force; so much so, in fact, that his articles on the subject have attracted considerable attention, and the views therein expressed have been received with favor by financial critics.

There is an austerity about the suggestion that shields it from attack on the ground of visionary speculation. The nation has been so deluged with wild and impracticable schemes tending, in the minds of their promoters, to simplify the great financial problems of the hour, that the severe simplicity of Mr. SYLVESTER'S theory is a positive relief; and if we may be pardoned the liberty, we might say with some truth that this unusual absence of radicalism has evoked greater encomium than the suggestion really merits. The issue of bullion certificates in the manner and for the purposes advocated by Mr. SYLVESTER is, to our way of thinking, open to serious objection.

Epitomized, the operation of the projected system of bullion certificates is as follows: The various assay offices and sub-treasuries throughout the country are to be empowered to receive on deposit from individuals, gold and silver bars, and in return are to issue certificates for the amount of bullion deposited. These certificates are to be payable in bullion to the bearer on demand, and will thus become mediums of exchange, or currency. Upon the bars the government is to stamp in legible characters, their weight, fineness and calculated value, supplemented by the impress of the American eagle as a governmental trade-mark. The bars are to be of various sizes to provide for denominational certification, and sufficient bullion will be converted into coin to serve for the redemption of certificates of small value. Gold in bars of standard fineness and above, are to be legal tender, and silver in similar bars legal tender at its market value. Presuming upon the recognized superior convenience and adaptability of notes over coin, Mr. SYLVESTER argues that in a short time these bullion certificates would become the national currency, the present coinage being discontinued save in such limited quantities as may be necessary to redeem the certificates of small value.

The arguments most favorable to the system are those in relation to the certificates for the deposit of gold bars

which are legal tender at their face value, but even here much objection may be justly interposed. The system does not demand the retirement of bank notes, but such an emergency is contemplated, and should it take place, the money of the country would be absolutely in the possession of the government; a small amount of coin, estimated at one-tenth the present coinage, alone remaining in circulation. It is open to question whether such an aggregation of wealth in the hands of the government would not be injudicious. Furthermore, should these certificates ultimately take the place of our present currency, the government would be deprived of the advantages of its credit and resources; advantages which every financial or mercantile house possesses to a greater or less extent. For every dollar issued in the form of bullion certificates, the national treasury must hold in custody one dollar in bullion; and while the absolute safety of this provision is beyond question, it is to be doubted if the supply of bullion would be adequate to insure a sufficient certification to meet the demands of trade. It is not generally claimed that the government should constantly hold in deposit sufficient gold and silver to redeem at sight every dollar that has been issued in the form of notes, any further than individuals should stand ready at any moment to liquidate their entire indebtedness. Sufficient only is required to insure the currency a par value, and provide for the sight redemption of such as may be presented. The credit of the country can sustain considerable over-certification in its present system of currency, and the amount will regulate itself, being governed by the relative value of gold and paper. So long as they are identical in value, the credit and resources of the country rectify the discrepancy between the actual money in the possession of the government and its outstanding notes. With bullion certificates in the form and manner proposed, such advantages could not be derived.

We will assume, however, that the government may be empowered to indulge in over-certification of bullion to the same extent as it may safely do at present in the issue of currency. In this event, there seems to be no reason why banks and individuals may not imitate the national example. These latter may also issue bullion certificates and likewise over-certify. A bank note is now worth its face value for the reason that it is endorsed by the government. But if the banks enter into competition with the treasury in the issue of bullion certificates, it seems difficult to prevent an over-certification by private individuals and corporations, which is far different in its effects from that based upon the credit of the nation, where bankruptcy is practically impossible. The failure of the Marine Bank and the disclosures of the peculiar methods of the firm of GRANT & WARD within the past few days are painful reminders of the difference between national and individual credit.

Strongly as these objections may apply in the issue of gold certificates of deposit, they are intensified when the same process is applied to silver, and new and graver obstacles arise. Mr. SYLVESTER'S project contemplates the establishment of gold in bars of standard fineness and above as legal tender, but his treatment of silver is not so sweeping nor explicit. Silver in similar bars is only to be made legal tender at its *market value*. In accordance with the system the Secretary of the Treasury is required to ascertain daily the relative value of gold and silver at the cities of New York, San Francisco, London and Paris, and, transmitting the average of the same to various centers, shall cause it to be prominently posted. The average value of silver during each year is to be the standard of operations for that next ensuing.

The evils of a bi-metallic monetary system are manifold, but that they are to be overcome by an entire subserviency of one metal to the other seems a most dangerous proposition. Better the disease than the remedy. Gold and silver are commodities, and subject to fluctuation in their values, both relative and intrinsic. The laws of supply and demand are as rigidly obeyed in the exchange of gold and silver as in that of any merchandise, but silver more especially varies in its value, and herein lies the trouble. Did the *relative* value of gold and silver remain constant, all objection to a bi-metallic standard would disappear, but its variance is the source of much complication and difficulty, in which silver as the baser metal suffers. In our opinion this difficulty can only be met in one of two ways: either retire silver as a standard and let gold alone circulate as actual money, or take no note of the variation in their relative value save at such rare intervals as when the disproportion becomes so great as manifestly to injure trade.

In the system advocated by Mr. SYLVESTER, this variation in the relative value of gold and silver is seized as a pretext for the issue of currency of two kinds; one possessing a definite face value and the other a speculative value, varying according to the market value of the metal upon which it is based. Thus to-day a silver certificate will be worth more than cost; to-morrow less. According to Mr. SYLVESTER, the gain or loss involved may fall upon either the holder of the certificate or the government, and two Congressional enactments are offered to determine definitely who shall take the chances. In the face of this admission we cannot allow the superiority of bullion certificates as preventives of speculation, which is a strong point urged in their favor. It strikes us that the temptation and opportunities afforded for the wildest sort of speculation are very conspicuous. It is necessary at the outset that the government should determine whether it or the depositor should assume the risk of loss or gain, but either way the element of chance is present, and speculation in silver certificates would infallibly result.

Mr. SYLVESTER has handled the subject vigorously and well, and the fact that his system is open to serious objection does not militate against its soundness, for it is more than likely that no monetary schemes have ever been suggested, or ever will be that are without defects. Money in the abstract has never been properly defined, and from its peculiar nature, never can be. It is easy to say what it is not, but almost impossible to determine what it is, and with this negative definition the world must be content. It is neither value pure and simple, nor the creation of the fiat of the government. That both of these elemental properties enter into money is palpably true, but which is the crowning power cannot be told. Money is an entity, but no economist can say which of its two properties is the body and which the soul, nor is it probable that either will ever assume its exact relative importance. Mr. SYLVESTER has exalted simple value at the expense of the governmental fiat, but whether in the religion of money he would be orthodox or heterodox no one can satisfactorily affirm. It is apparent to us, how-

ever, that he possesses decided views of the superiority of value alone in money, unsupported by the dictum of the government (save in the capacity of assayer and weigher), over the significance imparted by the exercise of the arbitrary power appertaining to all nations; and these views we hold to be extreme. His system presupposes that money is simple value, which doctrine we hold to be equally incorrect with that of the moribund Greenback party, which claims that the fiat of the government can create money without the necessity of a standard of value.

Bullion is money in embryo, but it has not reached the state where it can rightly be called money in fact. The attest of the government as to its fineness, weight and value cannot make it money, any more than the gauger's mark upon a barrel of spirits could render it a medium of exchange, and the two acts are identical. Neither could the bullion certificates themselves be deemed money since they are but promissory notes. In fact, Mr. SYLVESTER'S system, were it adopted, would result in the retirement of money in its proper sense, and a substitution of a simple exchange of valuable commodities. None can question the absolute correctness of this elemental form of exchange, but the medium employed is not money. The adoption of such a system would be a return to the primitive methods of exchange, and the wisdom of this extreme simplicity in view of the present complications and minute ramifications of trade is much to be doubted. It cannot be claimed that our present monetary system is without a flaw in theory or practice, but we can in a great measure safely trust the evils to adjust themselves. Conservatism is nowhere so strongly demanded as in the consideration of problems of finance, and better, far better, is it to endure our present ills, than adopt as a remedy a system that has objectionable features whose possible injurious effects are so apparent.

INVENTORS AND THE CAR BUILDERS' CLUB.

AMONG the topics for discussion at the April meeting of the Car Builders' Club were automatic freight car couplers, and the heating, ventilating, and lighting of passenger cars. These are all matters of importance, as is evidenced by the interest manifested by the members present, but there is yet a yawning chasm between inventors and railway officials that should be bridged over at once. There has long been a feeling of hostility to inventors by railway owners and managers which has been altogether unprofitable, not only to those mentioned, but to all mankind who have been deprived of the advantages that would have been derived from the use of appliances that contribute to safety and comfort. It is true that railway companies have expended large sums for heating, lighting and ventilating, but no satisfactory system of ventilation has yet been brought into general use, owing partly to the difficulties to be overcome in admitting air and excluding dust and cinders, and partly to the treatment inventors receive at the hands of officials, which discourages them; and with no hope of success they leave the field. Let it be understood by inventors that railway officials are willing to pay reasonably for meritorious inventions, and there is no doubt that these much desired improvements will be brought out in due time. As a rule, inventors are too poor to spend brains, time and money in perfecting inventions for the good of mankind with no hope of a reward, and unless they are assured of better treatment in the future, railway improvement may be considered at an end. It is not expected that railway officials will adopt all of the thousand and one alleged improvements that may be brought to their notice, but they can at least select what seems the best, and test them and pay for those that are satisfactory.

It was proposed at the meeting here mentioned, that a board of experts be appointed by the club to examine inventions and decide which of them have sufficient merit to warrant a trial. It was argued that the duties of car builders were such as to preclude the possibility of their acting on such a committee and do justice to all concerned, and it was also urged that railway companies would hardly be willing to allow their car builders to act on such committees and pay them for the time expended. Several inventors present signified a willingness to subscribe to a fund to pay a committee of experts to examine railway inventions and devote their time wholly to that. There is no doubt that some arrangement of the kind would be satisfactory and result in much good. But probably the worst thing to get over is the car-couplers, of which there are by far too many thousands for profit to any one. It was stated that the endless number of coupler patents made it too great a task to tackle with a view to selecting the best. One gentleman present stated that something must be done at once in the way of safer couplings, and that although it is not an easy matter to decide as to the best coupler, the only way is to make a move and keep taking the best until satisfaction is arrived at The longer a vigorous move is postponed, the greater the obstacles in the way. The public are becoming restless at the great loss of life in coupling cars, and legislative enactments may force railway companies to use couplings that are not the best, or as good as they would select of their own accord. The railways will promote their interests by acting voluntarily in the premises. It is not always pleasant to the public to interfere with railway management, but unless the managers show a disposition to make an effort to stop the slaughter caused by the deadly coupler and frog, there will certainly be an unpleasant interference in railway management by the authorities. Practical railroad men are better judges of safety appliances than professional law-makers, and if they will act in the matter at once and convince the public that they are alive to the importance of safety coupling devices, and foot guards for frogs and guard rails, they will save themselves a great deal of trouble and annoyance that will surely arise from unwise legislation enforcing the adoption of inferior or worthless devices, that will be engineered through Congress by politicians who have as little regard for human life as some of our most heartless railway magnates, and who have a share of the plunder for their *influence.*

It would be a dismal state of affairs if railroad companies were forced by law to adopt an automatic coupler for freight cars at a cost of $50 per car, when they can get a superior article for less than $4 per car, and give them the best coupling in the world; yet such a thing may happen unless railroad men will take the initiative, and manage business in a manner that will be more satisfactory to the public than the present wanton destruction of human life.

Railway Associations.

ALMOST every department of the railway service has its association, and much good has resulted therefrom, but some of these organizations might very properly be laid up for repairs. That is to say, that like other railway machinery, they have done much service and need overhauling, rebuilding and improving. Most, if not all railway associations, or associations of railway operatives were organized for the mutual benefit of themselves, the railway owners, and the public at large. In most cases these associations have been beneficial, but in some instances, owing to lack of interest, or bad management, and some crookedness, all has not gone as smoothly as might be desired. Again, as railways increased, the requirements of such organizations changed, and got behind time in railway progress, and need reorganization and repairs. Machinery that was satisfactory twenty-five or thirty years ago would not be up to the requirements of to-day; and that is the case with some of the associations. This has no reference to the mutual insurance department of associations, but will deal more directly with what will improve the condition of railways and contribute to the safety and comfort of all who have to do with railways either as employés or patrons.

An opportunity for an interchange of ideas is afforded by meetings of associations, and the knowledge gained at these gatherings is valuable alike to the members and their employers. Men of long experience attend these meetings loaded with the idea that their ideas are correct and eminently sound, and entertain a sort of mild contempt for the opinions of some of the younger members on account of their lesser experience. But it frequently happens that veterans return to their homes full of new ideas gained from young men whose experience is limited as compared to their own, and there is no better place in the world to correct errors of opinion than at a club meeting or convention. If a member has made a mistake and is laboring in the wrong direction, he will be convinced of his errors and started aright.

It is usual for those who seek advice to apply to those who have a reputation as experts in the particular line on which they desire an opinion. This is the right thing to do, but it is unsafe to put too much reliance on one man's decision. He may have a pet scheme of his own, or he may be using his influence for a friend who has given him lucre, which hath exceeding great power in warping a man's judgment. Or, he may form a wrong opinion of the merits of the device. Recently a prominent engineer was asked his opinion of a very simple device, which he condemned in unqualified terms, and regarded it as utterly worthless for the purpose for which it was designed. Now it so happened that the device had been thoroughly tested (without his knowledge) and found in practice to work admirably. Had the inventor of the device sought the advice of the great engineer at the start, the world would have been deprived of the use of a valuable invention. Incidents of this kind occur almost daily, which proves the danger of placing entire confidence in a single authority. Indeed, opinions are not to be trusted at all except in rare instances, and nothing short of practical tests can be relied upon with safety. The opinion of a *Board* of experts would be worth something, but a single individual opinion is dangerous for reasons other than those mentioned above. One man produces an invention which he believes to be valuable, but not having sufficient confidence in his own judgment, counsels with an engineer or mechanic, who tells him he has an excellent device, and advises him by all means to push it. He then uses up all his own means and all he can borrow, and finds when too late that all his labors have been in vain; that his invention is worthless.

Briefly, then, it is unsafe to rely on single opinions, and the only way out of this difficulty is to give practical tests, which shall be conducted by a board of experts of unquestioned ability and integrity. It is an easy matter to secure the former qualifications, but in these days of universal crookedness it may be somewhat troublesome to secure the latter requisite. However the importance of the matter is sufficient to warrant a trial, and it would seem that a check might be put on rascality, which in this case may be more fancied than real. At all events there are numerous meritorious devices that are out in the cold, for the reason that the inventors have been advised by some one in whom they had confidence that it was not good, or because he could not get it tested practically.

Again, some of the railway associations, or rather some of the members, regard it as too laborious a task to select the best of any line of inventions and give them a trial. They say life is too short to go through a long list of patented inventions and determine as to their relative merits, but it seems to be a very thin excuse to refuse to adopt any meritorious improvement for the reason that out of so many they might not get the best. Moreover, many railway officials regard any change in appliances as too expensive, and continue the use of inferior and worn out machinery. Go through any thriving manufacturing establishment and you will be told by the superintendent that he changes his machinery just as often as any improvement is brought out. Recently a printing establishment changed machinery at an expense of $300,000, which displaced that which was by no means worn out, but only sold for a few thousand dollars for old iron. If individuals find it to their advantage to secure the latest improvements, it would seem that railway owners might also economize by getting the best that can be secured by any reasonable outlay. Of course it is easier to suggest remedies for the evils under consideration, than to apply them when there is so much red tape to contend with, but personal interest should never stand in the way of any invention that will prevent accident, or in any manner contribute to safety of life and limb, or health and comfort.

Among the railway associations that are specially organized for the prevention of accidents we may mention the Yard Masters', Road Masters', Master Mechanics', Master Car Builders', Association of American Railroad Superintendents, and the various engineering associations, all of which have more or less to do with the improvement of American railways. Thus far these associations have made a specialty of matters relating to their particular departments, but as some of the members of these organizations are heads of various departments, it affords them an opportunity of being conversant with the wants of railway improvements at large; and in view of the growing demand for Improvements, it would seem that a new association might properly be formed by selecting some of the members from the existing organizations and giving them a larger field of operations than is now occu-

pied by any existing organization. Several titles have been suggested for a new association, and none will be suggested here; but as something of the kind is sure to come in the near future, the organizers can select a title to their own taste. The object of an association which shall be an outgrowth of existing organizations will be to establish a bureau of experimental research, and which shall be supported by assessment of mileage or earnings as a basis of all the American railways, and each to share in the benefits arising therefrom in proportion to their assessments. In other words, let some of the railway kings who have made their millions out of railroads, donate liberally to establish a railway experimental bureau, and then let the different roads be taxed to support it, and when a diamond is found among the sand that is thrown in to be washed, let it be divided among the tax-payers.

There are experts enough in this country to take charge of an experimental bureau who can be relied on, and by a little good management such an institution may be organized and supported, and perhaps in a little time might become self-supporting. This is a matter that concerns the railway public, and all that is required is to start properly; and it would seem that with the experience of officers of the various existing associations the "American Railway Association" might be brought out and made a success. Let all railway officials give their attention to this matter, and issue a call for a convention in September next to consider the matter, and something will be done.

An American Exhibition in London.

ARRANGEMENTS are on foot, it appears, for a very comprehensive exhibition of American products and manufactures, to take place in London, in 1885, and the project has been placed in charge of General C. B. Norton, secretary of the recent foreign exhibition in Boston.

The idea is a good one, and General Norton, from his experience in Paris, Philadelphia and Boston exhibitions, should be a good man to prosecute it. The fact is that America has never made a favorable showing at any of the foreign exhibitions. In London and Paris we made comparatively light displays, our railroads not exhibiting at all, and in Vienna our efforts were not commendable, and were rendered abortive by the conduct of the American department. At Amsterdam, last year, we were represented only by a few sewing machines and parlor organs. It has been seen, however, at the Centennial and the Atlanta exhibitions, and at the fisheries exhibition in London, in 1883, that there is almost no department, natural or artificial, in which America cannot offer an exhibition that shall be generally attractive. This is particularly the case in the magnificent show of natural products which can be organized by our great railroad trunk lines, and which would be entirely new to London or any other European capital. It is to be hoped the American exhibition will make a liberal display in this direction as an encouragement to the emigration of the better class of English farmers, very few of whom have yet come to this country, and who would better themselves by coming, besides being very desirable citizens.—*New York Herald.*

General Norton's address is Hotel Vendome, Boston.

DESERTS and rewards go not often together,

Pennsylvania Railroad.

THE following is a condensed statement of the business done by the Pennsylvania Railroad Company, for the year ending December 31, 1883.

NO. 1. PENNSYLVANIA RAILROAD.

Main Line and Branches, Pittsburg to Philadelphia.

	1882.	1883.
General freights	$23,517,178	$24,536,789
Miscellaneous freights	215,409	211,401
First-class passengers	5,567,561	5,812,584
Emigrant passengers	271,016	177,041
Adams Express	462,361	465,266
Carrying United States mails	506,921	484,352
Miscellaneous passengers	123,877	125,797
Rents	172,634	174,582
Total earnings	$30,836,962	$32,017,813
Total expenses	17,878,776	18,321,413
Net earnings from operating	3,973,308	4,676,959
Add interest, royalties, etc.	3,973,308	4,676,959
Total net earnings	$16,931,494	$18,373,359
Deduct interest, rentals, taxes, etc.	6,162,931	6,429,927
Net income, No. 1 Division	$10,768,563	$11,943,432

NO. 2. NEW JERSEY DIVISION.

United New Jersey Railroad and Canal Company, including Belvidere Delaware Railroad and Flemington Branch.

	1882.	1883.
General freights	$ 7,549,963	$ 7,984,145
Miscellaneous freights	293,215	285,798
First-class passengers	5,184,213	5,490,381
Emigrant passengers	67,052	51,866
Express	324,421	342,229
Carrying United States mails	188,311	178,091
Miscellaneous passengers	70,865	76,030
Delaware and Raritan Canal	553,418	548,055
Total earnings	$14,231,458	$14,956,595
Total expenses	10,169,094	10,804,913
Net earnings from operating	$ 4,062,364	$ 4,151,682
Add—interest from investments	246,926	311,650
Total net earnings	$ 4,309,290	$ 4,463,332
Deduct—guaranteed dividends, interest, etc.	4,878,049	5,117,247
Net loss under the lease of United New Jersey Railroad and Canal Company's property	$568,759	$653,915

NO. 3. PHILADELPHIA AND ERIE RAILROAD DIVISION.

Philadelphia and Erie Railroad.

	1882.	1883.
General freights	$ 3,138,456	$ 3,243,573
Miscellaneous freights	115,018	108,845
First-class passengers	660,765	660,454
Emigrant passengers	8,246	7,288
Adams Express	47,900	44,822
Carrying United States mails	27,464	27,498
Miscellaneous passengers	13,564	16,363
Total earnings	$4,011,413	$4,418,843
Total expenses	2,599,535	2,620,824
Net earnings	$1,411,878	$1,488,011
Deduct—interest and extraordinary exp.	160,410	172,289
Net eaarnings applicable to pay interest, etc.	$1,251,468	$1,315,738
Deduct amount paid Philadelphia and Erie Railroad Company as rental	1,251,468	1,315,738

SUMMARY.

Net income, No. 1 Division	$11,943,432
Less—Net loss, No. 2 Division	653,915
Balance	$11,289,517
From this balance the following amounts were deducted: Purchase of securities guaranteed by the Pennsylvania Railroad Company, $600,000; redemption of consolidated mortgage bonds, $280,860; Allegheny Valley Railroad Company—deficiency in meeting interest guaranteed by the Pennsylvania Railroad Company, $251,519; advanced to pay bond due to State of Pennsylvania, guaranteed by Pennsylvania Railroad Company, $100,000; other advances to same company, $309,491; Frederick and Pennsylvania Line Railroad Company—deficiency in meeting interest, $15,000; American Steamship Company—interest on bonds guaranteed by Pennsylvania Railroad Company, $90,000; advances, $90,000	1,736,870
Balance to credit of income account	$9,552,647
Out of which was paid dividend of 8½ per cent	7,530,650
Leaving amount transferred to credit of profit and loss account for 1883	$2,021,997
Deduct balance in settlement of claims and old accounts and amount charged off for depreciation	603,452
Total amount to credit of profit and loss for the year 1883	$1,418,545
Add amount to credit of profit and loss December 31, 1882	12,184,639
Balance to credit of profit and loss December 31, 1883	$13,613,384

CAPITAL EXPENDITURE.

To provide the additional facilities needed on the Main Line and the New Jersey Division. and to aid in the con-

struction of additional branch and auxiliary lines necessary for the promotion and protection of your traffic, there was obtained—through allotments to the shareholders and the privilege of converting a portion of their dividends into stock, and from the sale of $3,000,000 of the collateral trust loan of the company, the sum of $10,168,450. Of this amount there was expended the following sums, the balance remaining in the treasury:

Pennsylvania Railroad and branches		$2,654,907
United Railroads of New Jersey		365,904
Philadelphia and Trenton Railroad		221,411
		$3,242,222
Advanced during the year for improvements and extensions on branch and auxiliary lines operated by the company	$1,292,139	
Advances on account of constrnction of new branch and auxiliary lines	4,771,836	
Total on branch and auxiliary lines	6,063,975	
Less received from the above companies in cash on account of said advances	956,734–5,107.241	
Total amount expended on capital account in 1883		$8,349,463

On account of the above advances to branch and auxiliary lines, there was received in securities of those companies, $4,997,309.

Traffic, etc., Main Line and Branches.

	1882.	1883.
Tons of freight moved	20,360,309	21,674,160
Coal and coke shipments (tons)	11,157,146	12,426,888
Oil shipments (barrels)	3,972,121	1,756,696

LINES WEST OF PITTSBURGH.

The following statement gives the result of the lines owned or controlled by the company west of Pittsburgh operated by the Pennsylvania Company, and the Pittsburgh, Cincinnati and St Louis Railway Company:

	1882.	1883.
Pennsylvania Company—		
Total earnings	$19,025,661	$19,147,347
Expenses	10,976,121	11,966,297
Net earnings	$8,049,540	$7,181,050
Deduct rental, interest, etc	6,180,162	6,385,846
Balance	$1,869,378	$795,204
Pitts., Cin., and St. L. Ry. Co.—		
Total earnings	$6,660,629	$7,045,314
Expenses	4,694,649	5,141,265
Net earnings	$1,965,980	$1,904,049
Deduct interest, rentals, etc	1,971,546	1,875,357
Balance	$5,566	$28,692
Net profit	$1,863,812	$823,896

The other lines west of Pittsburgh, in connection with which the company has assumed liabilities, or which it controls through the ownership of securities, but which are worked through their own individual organizations, are the Chicago, St. Louis and Pittsburgh Railroad, St. Louis, Vandalia and Terre Haute Railroad, Grand Rapids and Indiana Railroad, and roads operated through its organization, and East St. Louis and Carondelet Railway.

	1882.	1883.
Aggregate earnings	$9,644,713	$9,934,663
Expenditures	7,697,559	7,864,995
Net earnings	$1,947,153	$2,069,668
Deduct rentals and interest	1,909,965	2,187.835
Balance	(profit) $38,188	(loss) $118,167

Of this loss ($118,167) the Pennsylvania Railroad Company, under existing contracts, is directly or indirectly responsible for $11,227, which, deducted from the above-mentioned profit of $823,896, leaves:

Net profit on all lines west of Pittsburgh	$812,609

The Pennsylvania Company, after meeting all its obligations, was able pay a dividend of 4 per cent., and carry to the credit of profit and loss a surplus of $72,829.

SUMMARY OF INCOME OF LINES OWNED OR CONTROLLED EAST AND WEST OF HITTSBURGH.

	1883.	1882.	Increase.
Gross earnings from traffic	$105,653,532	$101,514,926	$4,138,606
Gross expenses, excluding rentals, interest, dividends, etc	68,917,056	65,385,714	3,531,342
Showing net earnings	$36,736,476	$36,129,212	$607,264

FREIGHT TRAFFIC.

	1883. No. of Tons.	1883. No. of Tons 1 Mile.	1882. No. of Tons.	1882. No. of Tons 1 Mile.
Lines E.of Pittsburgh & Erie	57,379,115	5,066,083,175	54,822,558	4,862,702,539
Lines W. of Pittsburgh	26,319,047	2,693,140,873	24,977,807	2,729,844,763
Totals	83,698,162	7,759,224,048	79,800,365	7,592,547,302

PASSENGER TRAFEIC.

	1883. No. of Passengers.	1883. No. Passgrs. 1 Mile.	1882. No. of Passengers.	1882. No. Passgrs. 1 Mile.
Lines E.of Pittsburgh & Erie	36,584,435	789,134,935	33,657,024	748,484,865
Lines W. of Pittsburgh	12,262,376	366,774,204	11,611,639	369,349,969
Totals	48,846,811	1,155,909,139	45,268,663	1,117,834,834

The aggregate amount of steel rails laid in 1883 on all the lines owned, controlled, or operated by your company east and west of Pittsburgh, was 67,864 tons.

CONDENSED BALANCE-SHEET, DECEMBER 31ST, 1883.

Liabilities.

Capital stock		$92,619,750
Funded debt		59,746,153
Mortgages and ground-rents payable		1,824,027
Penn. Co. for Ins. on Lives, etc., "Trust certificates"		9,143,000
Balance due to other roads		584,477
Pay rolls and vouchers for December		4,399,056
Cash dividend unpaid		61,590
Dividend scrip outstanding		330,360
Sundry accounts due to other roads		11,374,119
Securities owned by the United New Jersey Railroad and Canal Compahy, transferred with the lease		3,859,295
Equipment of United New Jersey Railroad and Canal Company, transferred with lease		2,267,004
Fund for the purchase of securities guaranteed by the Pennsylvania Railroad Company		3,100,000
Consolidated mortgage bonds redeemed		1,489,610
Balance to credit of profit and loss		13,613,184
		$204,411,625

Assets.

Construction, equipment, and real estate accounts for the railroads between Philadelphia and Pittsburgh		$73,912,855
Cost of bonds of railroads		30,160,691
Cost of stocks of railroads		58,568,560
Cost of bonds and stocks of municipal corporations, coal companies, canal companies, bridge companies, and investments not otherwise enumerated		6,602,464
Managers of trust created by Pennsylvania Railroad Company, October 9, 1878		3,100,000
Insurance Fund		10,000
Mortgages and ground rentals receivable		57,650
Amount expended for the purchase of anthracite coal lands		709,336
Appraised value of securities owned by United New Jersey Companies, and transferred with lease		3,859,295
Equipment owned by United New Jersey Companies, and transferred with lease		2,267,004
Amount of fuel and materials on hand		3,963,457
Amount of bills and accounts receivable, and amounts due from other roads, including advances made to railroad corporations for construction and purchase of equipment used on their lines, viz:—Philadelphia and Erie Railroad Company, United New Jersey Railroad and Canal Company		1,064,818
Sinking fund and redemption account		1,350,440
Real estate		600,144
Philadelphia and Trenton—Construction real estate		108,195
Other companies		8,565,018
Cash balance in London		1,135,697
Cash in hands of freight and passenger agents		2,064,651
Cash in hauds of treasurer		5.699,455
		$204,411.625

THE next Annual Convention of the Master Car-Builders' Association will be held in Saratoga, beginning Tuesday, June 10, at 10 A. M. The following is a list of the subjects on which it is expected that special reports will be made, and which will be discussed:

1. On Sharp Flanges—Their Cause and Prevention.—2. On Standard Freight and Passenger Car Trucks.—3. On Brake-Shoes, Brake-Beams, and the Interchangeable Parts of the Brake Arrangements of Cars.—4. Standard House-Car to Carry 60,000 lbs. of Lading.—5. Standards and Appliances for the Safety of Trainmen.—6. Piece-Work in Building Freight-Cars.—7. Plans for Car-Shops and the Arrangement of Car-Shop Machinery.—8. Freight-Car Framing and Trussing.—9. Passenger-Car Framing and Trussing.—10. Automatic Freight-Car Couplers.—11. Automatic Freight-Car Brakes.—12. Freight-Car Roofs.—13. Side-Dumping and Drop-Bottom Coal-Cars.—14. A System of Lettering and Numbering Line Cars.

A RETROSPECT:

BEING A

Complete History of Railroad Progress in America.

Compiled from this Journal, beginning Fifty-two years ago.

CHAPTER V.

PASSAGE OF THE DAYTON AND SANDUSKY RAILROAD BILL—THE BUFFALO JOURNAL'S ANTICIPATIONS OF THE IMPORTANCE OF THIS LEGISLATION TO THE STATE OF NEW YORK—REVIEW OF "INTRODUCTION" TO A PAMPHLET ON RAILWAYS AND STEAM CARRIAGES, WRITTEN BY COLONEL JOHN STEVENS, OF HOBOKEN, NEW JERSEY, IN 1812—EDITORIAL OBSERVATIONS ON THE SAME, IN 1832—A SUGGESTION.

ON the fourth of January, 1832, the Buffalo *Journal* stated its anticipations of the advantages to New York which would result from the construction of the Dayton and Sandusky Railroad. "By a private letter from Ohio, to a gentleman in this village," says the *Journal*, "we learn that the Dayton and Sandusky Railroad bill has become a law. No event, since the completion of the Erie Canal, equals this in its consequences to the State of New York. It annihilates space between the navigable waters of the Ohio and Lake Erie, and removes the last barrier to a regular, rapid, and cheap communication between the valley of the Mississippi and the city of New York. When that road is finished, it will draw all the travel from the southwest through this place to our State metropolis. Let those who shall doubt me—and there will be many such—bear our assertion in mind, and cast it in our teeth when time has proved it erroneous. They will be wearied in waiting."

A most interesting feature of No. 3 of the AMERICAN RAILROAD JOURNAL is a reprint of the introduction of a pamphlet published in 1812. It was entitled, "Documents Tending to Prove the Superior Advantages of Railways and Steam Carriages over Canal Navigation." The author was Colonel John Stevens, of Hoboken, New Jersey, and the publishers, T. & J. Swords, of New York. As the date of the introduction was May 15, 1812, the editor's emphatic manner of bringing the reprinted introduction to the notice of his readers is accounted for fully. "It may be well to premise," he writes, "that the documents here alluded to, were propositions submitted by Colonel J. Stevens, of Hoboken, New Jersey, to the Canal Commissioners of New York, before a spade had been stuck into the ground, for connecting Lake Erie with the Hudson by a railroad in preference to a canal."

Mr. Stevens's "Introduction" is a well-written and readable piece of work. He commits the accompanying documents to the press, he says, "from an estimation of their importance, and from a full conviction of the practicability of the proposed improvement." Further on he remarks with the dignity and confidence of a man consciously ahead of his times: "Although my proposal has failed to gain the approbation of the Commissioners for the improvement of inland navigation in the State of New York, yet I feel by no means discouraged respecting the final success of the project." His opinion was that railways ought "to become an object of primary attention to the National Government," and expresses his belief that "the insignificant sum of two or three thousand dollars," taken from the national treasury, "would be adequate to give the project a fair trial." He proceeds to observe that on the success of this inexpensive experiment "a plan should be digested, 'a general system of internal communication and conveyance' adopted, and the necessary surveys made for the extension of these ways in all directions, so as to embrace and unite every section of this extensive empire." In support of this proposal he makes the statement, based upon calculations, that "the revenue which this mode of transportation, when brought into general use, would be capable of producing, would far exceed the aggregate amount of duties on foreign importations." The necessity of brevity prevents the possibility of reviewing the "Introduction" exhaustively, but one paragraph should be quoted for its historic value: "At a period like the present (May 15, 1812) when the ordinary sources of revenue continue no longer to pour into the Treasury of the United States their tributary streams, and when too we are called upon to make 'arrangements and exertions for the general security;' at such a period the merits of a system promising not merely to facilitate most astonishingly 'internal communication and conveyance,' but to furnish new and abundant sources of revenue, ought surely to command the attention of the general government, and cannot fail to 'be seen in the strongest lights.'" It is surely of great historic interest that our "unpleasantness" with Great Britain in 1812, was made an argument for the construction and control of a system of inter-state railroads. Colonel Stevens proceeds to expatiate on the comparative ease with which railroads could be constructed, "exempted totally from the difficulties, embarrassments, casualties, interruptions and delays incident to the formation of canals," and the wealth they would produce to the individual citizen,—"for every shilling contributed towards the revenue, a dollar at least would be put into the hands of individuals." His mechanical ideas are singularly quotable: "To the rapidity of the motion of the steam carriage on these railways, no definite limit can be set. The flying Proas, as they are called by voyagers, belonging to the natives of the Islands in the Pacific Ocean, are said at times to sail at the rate of more than twenty miles an hour. But as the resistance of the water to the progress of a vessel increases as the square of her velocity, it is obvious that the power required to propel her must also be increased in the same ratio. Not so with the steam carriage—as it moves in a fluid 800 times more rare than water, the resistance will be proportionably diminished. Indeed the principal resistance to its motion arises from friction, which does not even increase in a direct ratio with the velocity of the carriage. If, then, a Proa can be driven by the wind (the propulsive power of which is constantly diminishing as the velocity of the Proa increases) through so dense a fluid as water, at the rate of twenty miles an hour, I can see nothing to hinder a steam carriage from moving on these ways with a velocity of one hundred miles an hour. I will now just observe, that should it be considered an object of sufficient importance, sails might be used whenever the wind was favorable." The remainder of Colonel Stevens's "Introduction" consists of argu-

ments for the making of railways by the Federal Government, based upon considerations of their value for the national defense, and to expeditiously quell internal commotions; the assertion, backed by a quotation from the pen of President Madison, that there can be no constitutional doubt as to the power of Congress to lay out and make such roads; and of facts in the writer's opinion tending to show how "preëminently beneficial" railways were calculated to become to the Southern States. As regards these he thought "the projected improvement . . . . . would at once more than double the value of their products. It appears to me calculated to hold out the most flattering prospects of gain to such enterprising individuals or companies as might be induced to embark a capital in this object." The concluding words of the chapter introducing Colonel Stevens's pamphlet, continuing immediately after the passage just quoted, are these: "But, I consider it (internal improvement by means of railways), in every point of view, so exclusively an object of national concern, that I shall give no encouragement to private speculations, until it is ascertained that Congress will not be disposed to pay any attention to it. Should it, however, be destined to remain unnoticed by the general government, I must confess I shall feel much regret, not so much from personal as from public considerations. I am anxious and ambitious that my native country should have the honor of being the first to introduce an improvement of such immense importance to society at large, and should feel the utmost reluctance at being compelled to resort to foreigners in the first instance. As no doubt exists in my mind, but that the value of the improvement would be duly appreciated, and carried into immediate effect by transatlantic governments, I have been the more urgent in pressing the subject on the attention of Congress. Whatever then may be its fate, should this appeal be considered obtrusive and unimportant, or from whatever other cause or motive should it be suffered to remain unheeded, I still have the consolation of having performed what I conceive to be a public duty." Thus sonorously and conscientiously did Colonel John Stevens, of Hoboken, New Jersey, urge upon the Federal Government of the United States what he believed to be a right policy with regard to the new invention of running steam carriages on railways, in the year of grace 1812. Whatever might be thought of his politics, credit must be given him for superior acuteness of perception with regard to the value of the improvement he recommended, for his patriotism, and his faith in the future performances and unrivaled importance to the interests of the community, of internal communication by the use of steam.

The AMERICAN RAILROAD JOURNAL of January 14, 1832, contains a leading article on the "Introduction" just reviewed. Colonel Stevens was still living. Most of the objections to his theory of transportation, "stated as they were by such men as Gouverneur Morris, Robert L. Livingston, and De Witt Clinton," and advanced "with most undoubting confidence," had vanished into thin air before the light of experience. "Great and flourishing railroads" were then in use, "both in this country and in England." The writer commends especially the sagacity of a note to the pamphlet calling forth his remarks: "'It is probable,' says Colonel Stevens, 'that it may not in practice be convenient to exceed twenty or thirty miles an hour. Actual experiment, however, can alone determine this matter, and I should not be surprised at seeing steam carriages propelled at the rate of forty or fifty miles an hour.' How completely has the Liverpool and Manchester Railroad verified both branches of this remark! how incredible, up to the very day when it was thus verified, did such results seem to the immense majority of mankind!" (In 1884 the anticipation holds good, more than seventy years after it was written.) "Finding his suggestions unheeded in New York, Colonel Stevens, some years afterwards (in 1818 or 1819), addressed a memorial to the Legislature of Pennsylvania, then beginning to be moved by the spirit of internal improvement, recommending a communication between the waters of the Ohio and those of the Delaware, by a railroad from Pittsburg to Philadelphia. But the public mind was not yet ripe; Colonel Stevens was in advance of his age, and his counsels fell on deaf ears. It may now justly be claimed for this enterprising, sagacious and disinterested gentleman, that what others are effecting, he foresaw and recommended long years ago; and the honor is fairly his, of having first suggested, in this country, the advantages of railroads and steam carriages, and of having accurately estimated their speed and power. Our readers will, we are sure, think the space well occupied which has thus been devoted in this first AMERICAN RAILROAD JOURNAL, to an assertion of the sagacity and services of the first American projector of railroads."

"Honor to whom honor is due." You did well and wisely, Mr. Editor of long ago, to commend the unheeded services of Colonel Stevens, of Hoboken; and a capable pen ought to be found for the work, in this more appreciative age, of preparing a biography worthy in its completeness and accuracy of a subject so interesting and desirable as is that sagacious gentleman.

(*To be continued.*)

A New Departure by the Erie Railway Company.

THIS popular company, now known as the New York, Lake Erie and Western Railroad Company, by an arrangement with the Grand Trunk Railway Company, has just inaugurated a Pullman Buffet Sleeping Coach Line, running daily between New York and Detroit, via Niagara Falls, and the main line of the Great Western Railway. Under this new arrangement, which affords the only Pullman Buffet line running through to Detroit without change, passengers may leave New York at 6 P. M. and arrive in Detroit the next afternoon at 3 o'clock, making close connection for all points in Michigan. Returning, passengers from Detroit and all points in Michigan may leave Detroit at noon and arrive in New York at 11 o'clock the next morning. This new departure by the Erie cannot fail to be appreciated by a large portion of the traveling public, to whom it will be a great convenience.

THE offices of the Rand Drill Co., Manhattan Mining Co., Rendrock Powder Co., J. R. Rand & Co., A. C. Rand, and N. W. Horton were removed from 240 Broadway to more convenient quarters at No. 23 Park Place, on the 1st inst.

FORTUNE often rewards with interest those who have the patience to wait for her.

Communications.

Road-Bed, Track, and Its Fixtures.

Editor American Railroad Journal:

THE title of this article is one used by "Beginner," of Troy, in the March number of the JOURNAL, and as the subjects mentioned in his article are of great importance, the title will bear the warming-over process without being styled "Hash."

"Beginner" advances some sound ideas, and his remarks bring to mind the plantation philosopher's idea of the "fifty-dollar saddle on a twenty-dollar hoss." There are not a few roads in this country that run gilded palace, hotel, dining, sleeping and day coaches over tracks that are not in condition to carry such stock with any degree of safety, comfort, regularity or economy. It is certainly very desirable on the part of officials to please their patrons, who are by no means averse to style and elegant equipage, but if they were consulted in the matter they would doubtless prefer less gaudy trappings and greater safety of track and fixtures, or a less expensive saddle and a safer and stronger horse. Accidents from spreading of track are frequent, and this class of accidents is usually very destructive of life and property. Enormous sums are paid annually for people killed or injured from this cause; and to replace the gorgeous palaces on wheels that are made into splinters and burned in wrecks caused by spreading of track, is a heavy drain on the company's treasury. And yet, if an inventor of a cheap, effective and durable device to prevent rails from spreading were to offer his wares to a railway official he would be "fired" out of the office. It is not a difficult matter to build a track that will not spread, and an outlay of a merely nominal sum would save many lives and much treasure.

Truly the ways of some railway officials are past finding out, and why they will persist in refusing to put their tracks in a safe condition, and continue their wanton destruction of life and property is not easy to understand. The foundation of railway prosperity rests with the condition of the permanent way, and if that is neglected all is lost. Rolling stock may be in good condition when brought on the road, but it soon goes to destruction; and the road, with all its fixtures, equipment, appurtenances and owners all go down together in a common ruin. It matters not that the operatives have had experience and have been trained on the best managed roads in the country: they are powerless to perform in a satisfactory manner for want of tools. Train despatchers, conductors, engineers, and transportation men of all grades of the service may be as good as any in the land, but with a rattle-trap of a track their hands are tied. It is a matter of record that our most successfully managed roads are those on which the condition of permanent way has been considered of primary importance. When that is properly cared for, rolling stock can be kept in good condition, accidents will be few, the damage account trifling; and when a road is managed with a view to *safety* it will soon reach *comfort*, and then *luxury*. This has been written for the benefit of those who reverse the order of progress, and commence with luxury and end in a wreck in the hands of a receiver. Read, think, and act.

AN OLD HAND.

NEW YORK, April 20, 1884.

Editor American Railroad Journal:

THE compliments of Pontifex to Paradox, as he is glad to receive the sympathy and condolence of a professional friend. But some of his "old saws" are badly buckled and kinked; need straightening, and setting, and filing, in order to meet the case in question.

I presume your Journal is the place for hard facts in mechanics and science, and that matters of sentiment and affection will hardly fall on fruitful soil, if sent to you, but will be as those "seeds sown by the wayside, which fell upon a rock." Still, in these things, we engineers have to stand as much strain to the square inch section as any, and perhaps more. Also, perhaps our sweetmeats have as much if not more glucose in them, and our pure cider vinegar as much if not more sulphuric acid in it than the most of people have in theirs. Therefore I am glad that you lend a listening ear to lamentations over our and the public's wrongs. Paradox could have added one more old saw, a sort of a buzz saw which squeaks, and squeaks sadly, rusty from want of use. The absence of employment is not rest for the engineer, but is in the same straight line with the absence of the comforts of life, not to say luxury. Few of us, O alas! how few, are able to wear diamonds on our shirt-fronts, and how seldom are we able to pass beyond nobler nectar than rye. And neither is the idleness forced upon him by the most ridiculously absurd method of building public works, rest for the tax-payer. True, on this lively planet of ours, no one need be idle. The writer is strong enough to sling a pick, or make mud fly from a shovel, but such work would be waste for himself, and the public's best good.

The ignorance, arrogance, insolence and avarice of the corner grocery statesman and gin mill politician and political economist, steps in, however, and says for science and its votaries, what it was said a certain capitalist said for the public: "What school have these been educated in?" Here is another saw with fresh teeth cut into it. The abscess of moral and mental training is (as a general rule) a common city official. Paradox would eliminate the cancer, but when the sore is the biggest part of the organism, it will take quite a while to grind up the knife to do the job with.

"Education sometimes fits a mind to know which horn of a dilemma to take hold of first." What are you to do about it when you have no choice whatever, and both horns are under you, and you feel as if though the laws of gravity were set aside for your especial discomfort, and you are vainly seeking with both hands for a something to cling to, or a soft place to land into when they become operative again. His friends may, in finding him, judge he is "well corned," but he will say "bring no flowers," I was fooling with a bull's horns; I mistook them for those of a dilemma.

Paradox says, "An engineer's life should be 'real,' 'earnest,' full of truth," and so should that of your tailor, your shoemaker, groceryman, plumber. "His vote should be on the side of good order and good morals." Men of all parties and persuasions will agree with him. "Engineers who love science for itself should take time to study human nature in all its nakedness." It is the province of the engineer to apply the "exact science" in the various arts of construction. Here is presented a great difficulty. How are his exact standards to be applied. The strength of a man is stated to be one-fifth of one H-P. His standard will measure his height, weight, etc. But from the very nature of his exact methods he will meet with perplexity. His text books or tables furnish nothing. He must then extemporize an instrument—resort to an india rubber string in order to meet this case. You cannot make a profile of it; neither can you plot it or make a plan of it.

Pontifex was appealed to by a colored person whose exchequer was in a depleted condition, for pecuniary aid. A promise of assistance at a not remote period, drew forth the assertion that "While the grass am a growing, the horse am a starving." And so while the body politic is to be fumigated and purged by the uncertain ballot box, "well-corned horse sense" will hardly be willing to await the slow elimination by the natural selection of evolutionary methods. This horse will not be permitted to partake of the present crop. There will, however, be future crops which will grow green over the remains of those that have starved waiting for the nascent food, and there will be future horses that will devour and grow strong on the succulent herbage.

Future engineering will take care of itself. When whiskey, together with the slower processes of moral and mental evolution have freed the world from leather-headed persons who feel that they must fill some small conspicuous place in order to be happy, engineers will have little to complain of. Engineers are, in fact (aided by the clergy), largely the instruments which are being used to bring about this desirable condition of things.

But if he is sick, "if he loses heart," must he not go to the doctor—must he not have what other men have? Has he not a useful calling? Perhaps the most so of any. It is the present that perplexes us. What shall there be for breakfast in the morning! Let us see the bill of fare. Where can the best boots be had? Who makes them? Stop! not so fast; that transit in the corner is a sick transit, covered with cobweb and dust. It should be sent to the instrument infirmary, "*sic transit gloria mundi*," and that level assures one that life's profile is full of hard gradients.

Not a pessim(on)ist, not with a mouth all puckered up with sourness and bitterness, neither despondent nor gloomy, but with complacent independence. "What will other honorable branches do?" Take us by the hand and acknowledge that we are not "well-corned," but have good "horse sense," and can kick worse than a mule when occasion requires it.

That an engineer must not of need be his own gardener, boot-maker and tailor, his own doctor, lawyer, and servant girl. With as much justice, expect him to be his own army and navy.

Nor permit him to sit on his fence and see a few county officials essaying to erect a bridge with his money, which seems to him as grotesque and funny as the pictures in the last *Puck*, at which a dozen boys and men at the ferry house were grinning the other day with them.

I hope that Paradox and other engineers will bring all kinds of old saws, and new saws, to bear upon this question, and rip, and cross-cut it, until it resembles a Saginaw saw-mill's surroundings.

PONTIFEX.

THE fastest railroad speed on record is recalled to mind by a correspondent of the *Engineer*, who sends that journal a card, which has been preserved since 1848, on which is printed: "The Great Western Railway broad-gauge, 'Great Britain,' accomplished the fastest journey on record, viz.: From Paddington to Didcot, 53¼ miles, in forty-seven minutes. This train was the 9.15 express to Bristol, and consisted of four carriages and vans, and was driven on May 14, 1848, by J. Michael Almond, driver; Richard Denham, fireman."

Sham Tests of the Gibbon Boltless Rail Joint.

A technical journal, of recent date, published an editorial on "sham tests," and it is not easy to understand the position of the writer. He starts out with an evident intention of expressing an opinion regarding the merits or demerits of Gibbon's Boltless Rail Joint, but somehow got fearfully off, and says, in substance, that he does not know but it is the best joint in existence, or, it may be worthless; that is to say, we rather like the device but don't want to say so, or, ahem! we don't see any merit in it, but—well, it is a good thing or it is not, and we shall not express an opinion either way. But he keeps right along, first on one side the fence, then on the other, then crawls under the fence, and gets on the top, and these gymnastic feats seem to strengthen his decision, and he comes to the conclusion that the joint is worthless, and the tests were shams. But on another page of the same issue is an apology for his batch of contradictions. After saying that the "tests" were a sham, and the device worthless, in his apology he says: "We have elsewhere condemned "tests" of the Gibbon rail joint as shams." This condemnation, it should be understood, is aimed at the tests, and not at the joint,* which we have not pretended to discuss. Lest some may attach the opinion expressed of the tests to the joint tested, we publish below certificates favorable to the joint by railroad men who have used or examined it:

H. Patterson, Supervisor of Tracks of the Delaware and Hudson Canal Co., writes at Albany, Jan. 31, 1884:

"The 'Gibbon Boltless Rail Joint' has been successfully tested, and is now in use upon the track of the Delaware and Hudson Canal Co.

"As soon as the weather permits, we shall lay more rail and use this joint.

"It is with pleasure I certify that in places where rails become worthless from battered ends in using the fish-plate or angle-joint, this joint becomes especially valuable as a substitute for them, rendering it unnecessary to remove the rail, and therefore possesses an increased value as a saver of rails."

Thomas B. Purves, for thirty years Division Master Mechanic, Boston and Albany, writes at Albany, Feb. 6, 1884:

"This is to certify that I have this day, in company with J. White Sprong, Secretary Delaware and Hudson Canal Co.; E. A. Pearsall, of Coventry, Chenango County, N. Y., carefully examined the successful application of the Gibbon Boltless Rail Joint to the track of the Delaware and Hudson Canal Co.

"I have read the certificate of H. Patterson, Supervisor of Tracks of said company, and for 20 years or more Track-Master of railroads centering in and around Albany, N. Y. Mr. Patterson accompanied us in our investigations, and says that the joint has been successfully tested in the tracks of the Delaware & Hudson Canal Co. during a five months' test; that no joints have been broken since laid in the track; that it is impossible for the track to spread where the joint is applied; that the rail cannot creep with this joint; that it has an increased value as a saver of rail over the ordinary fish-plate or angle joint where the rails become battered down at the ends, and that the expansion and contraction of the rail is confined to each rail separately. From our examination it would seem to me that Mr. Patterson's claims are well taken."

The following are among the favorable notices (no others have reached us) which have appeared in various technical papers.

The *Railway Review* of March 28 last said:

"In tests and actual service the joint has met its claims and shown itself well adapted to insure a strong joint, the solidity of a continuous rail and absolute freedom from low joints. * * * The following are demonstrated facts:

"1. No repair has been made since the joints were laid. 2. It makes a smooth and continuous track. 3. It removes (absolutely) low joints. 4. The track cannot creep * * * and the joint cannot spread * * * 5. It removes all labor of low joints and loose bolts and utilizes rails which are battered at the ends * * * 7. It saves 1,500 lbs. of steel rail, to every mile of track. 8. The joint is made of Bessemer steel and cast direct from the converter, so that there is uniformity of wear of joint and rail. 9. It must preserve the life of the rail several years, on account of removal of low joints and loose bolts.

"The joint (as shown by the test sheets) is 25,000 lbs. stronger than the rail itself."

The *Railway Age* of March 31 said: A personal observation of it in practical operation enables us to say that it seems to be all that is claimed for it. Altogether the result of practical tests seems to fully bear out the claims made for it as forming a continuous rail without low joints, and preventing spreading and creeping of track."

In view of the above the JOURNAL sent a representative to Albany to examine the Gibbon joints that have been in constant use since September last. These joints were found to be in good condition, both in regard to surface and line, and also correct gauge. The boxing of the downward flange into the tie absolutely prevents spreading of rails, and consequently prevents many serious accidents. The *Railroad Gazette* reports eight accidents in March last from this cause. There was no lamination at the joints, and the ends of the rails showed no more wear than other portions. The joint spikes were all down snug to the head, whereas those at fish-bar joints were up from one to two inches, and loose. The nuts on the fish-bolts were all loose, and the ends of the rails brooming.

The Gibbon joints are placed among other styles of fastenings, and a careful inspection of the various kinds by a competent judge who is not "greased," will not fail to show that the Gibbon joint has many valuable features.

The JOURNAL representative was informed by a trackman in the yard that no work of any account had been performed on these joints since they were laid.

Below will be found some comparative statements and estimates which, with the deductions from tests may be regarded as trustworthy information, based on practical trials, without which opinions are of little value.

Approximate comparative Statement of Tonnage Blows, given in 200 days, on the track of the Albany and Susquehanna yard at Albany; also time required to perform the same by the following leading railroads of the country on main line:

Name of Railroad.	Between what Stations.	No. of Trains.	No. of Cars to each Train.	Approx. Tonnage Blows in 200 days.	Time required to perform. A. & S. Yard Record.	Single or Double Track.
		Pass. Frt.	Pass. Frt.			
†Albany & Susq.	Main Line, Albany Yard,	*250	*1000	5,700,000	200	Single.
N.Y.C. & H.R.R.	N. Y. & Spuyten Duyvil,	60 8	6 35	2,590,000	439	Double.
Do.	Albany & Schenectady,	11 —	9 —	483,000	2335	Four.
Long Island	Long Island & Garden City,	14 5	9 30	995,000	1148	Double.
Phil. & Reading	N. Y. & Elizabeth,	35 10	9 30	2,328,000	481	—
Albany & Susq.	Worcester & Oneonta,	8 32	5 20	2,570,000	440	Single.

* Approximate. 24 hours per day. †Yard-master record. ‡Taken from Time Tables.

The above calculation is based on the supposition that the driving wheels give a ten ton blow, the forward trucks two tons, and Tender and Car wheels four tons blow.

Little or no labor performed on this portion of the track since joints were laid.

*His gun must scatter awfully, for he hits all around.

Marks of the Brush.

BY A VETERAN.

THE care of details in the paint-shop is a subject that but few write about, and but few think of; yet it is that which makes perfect work as well as economy in the use of materials. The details of a shop are the little things, such as the placing or storing of the varnishes, pigments and liquids employed, the economical use of the same, the time of workmen, the correct manipulation of tools, etc.; and as it will accrue to the benefit of some one to have the *little things* looked after, I will make it a text for this article.

William Oakes is a good workman, a very fair foreman painter, and a clever fellow in all, but he passes unnoticed the barrel of "slush" standing in a corner, running over or reeking with nastiness; the floor around and about the bench carpeted an inch or two thick with paint; the paint mills in like condition, and although it is the accumulation of years, perhaps, there is evidently sufficient waste here to paint up a palace car. Oakes is what is called "easy-going"; the work turned out of the shop appears well, but there is a lack of care noticed by the expert. The trucks on this road are painted pea green, or at least are said to be, but we notice that the bottom, or parts "out-of-sight" have never received a touch of the brush; the wood and iron is bare in many places, and certainly this does not look as if the paint was intended as a preservative—simply for appearance; and when the nuts and bolt-heads rust off, or the wood rots out and drops to pieces, no one can tell why it does so. Those parts in sight which were well coated are almost as good as when new. The bottoms of cars, either freight or passenger, might be daubed over with some of the slush from the overflowing barrel; or a few pounds of Grafton paint mixed with oil, even fish oil, might be used to keep moisture out, prevent shrinkage or swelling of the wood, and rust of the metal, thus diminishing the stock of slush and making that part of the shop clean. Step irons, brake rods, shoes, etc., are all the better for heavy coatings of paint. But Oakes sets an indifferent workman at the job, and simply glances at it when it is said to be completed. The turpentine and oil are kept either in large tin cans or in the original packages, barrels, and the idea of improvement in this matter, it seems, has never entered Oakes's head.

No better plan for the storage of turpentine has come to my notice than the use of a safety oil tank, fitted with a pump to raise the liquid, and a drain to return all that falls outside of the vessel being filled, to the reservoir underneath. Not only is this a bar upon waste, but it is a safeguard against fire, for the inflammable substance is closed up in the tank or reservoir, and the evaporation of it is further prevented by a close-fitting cover or lid. Most large carriage factories have adopted them and they prove a success. Varnish stored in cans or barrels in a cold, damp building, cannot be expected to turn out well. It is one of the most delicate things used in a paint-shop. Cold or dampness will cause a sandy or gritty appearance, yet there are many who never give it a second thought. A close-covered tin or sheet-iron tank, with a faucet near the bottom, is best for holding varnish, for being in a large mass it is not so readily affected by atmospheric changes as when kept in five-gallon tin cans. A can for "pour-backs" should be kept for doing common parts or for mixing in paint, and in no case should the leavings in the varnish pot be returned to the tank.

Oakes keeps his men busy most of the time, but there is much time lost in rigging scaffolds, benches, planks, moving shop-fixtures about, etc., that he never seems to care about. Again, men are kept waiting for material at times, and although they are apparently busy, they are digging around here and there to make a show of doing something, when they are simply killing time. Small brushes are frequently used where a large one would do better and quicker work. An "old stump" can not be made to work as well as a good brush, and as soon as the tool becomes worn out it should be cast aside as worthless.

Oakes does most of the striping and ornamenting, and although he does it well, as a rule, he is not careful of some of the little things connected with that branch of the business. We frequently see the patterns or pounces which took him several hours to make, lying torn upon the floor, and utterly ruined, when with care, in putting them away in a box or in hanging them in a closet, they would answer for good service a long time. The pounce-bag may be found almost anywhere, there being no place for it, consequently a full half hour is wasted in hunting for it. Here is a lot of striping and lettering pencils stuck upon the window with tallow; some are straight, others crooked, while one or two are just upon the point of falling to the floor to join a dozen more long since groveling in the dust, when a nice tin box with a cover would hold them, clean and free from dust. The little details might be still further enumerated, but I believe a word to the wise is sufficient, and as it is only my province to make mention of a few and let others go on in the discovery of all that tends to injure the work or profits, I will say no more on this subject at present.

The gilding done in our shop—of late a large portion of the ornamentation is flat scrolling in leaf—gave us some uneasiness as to the *waste;* no better word can be thought of, although with all the supervision given to the gilder, no vicious disposal of gold could be discovered. John Wise was our gilder, and he had an idea that he knew all about the work. He had a nice little box in which he kept the scrap gold, and another for the bunch of cotton used to wipe off the superfluous leaf, and it had always been the custom to allow the gilder to sell the waste to a refiner, as a perquisite or addition to his salary. This appeared well enough, but the use of gold leaf had become so extensive that the office folks were getting anxious to know where the gold went.

Wise was in favor of laying the leaf direct from the book; that is, he used no tip and cushion in laying it, and he also was careful to lay a full leaf wherever it could be done, which made his work appear smooth and even. Now he might have gilded many parts of the work by lifting small pieces and laying them on with the end of the finger; but no, he was looking for more scrap leaf, and after running over the size, he would wipe off the loose gold and stow it away in the box. This plan went on for some time, until the pressure from the office was so great that a change had to be made. Wise didn't like this, but it couldn't be helped. First we tried the cushion, knife and tip of the picture-frame gilder, but after one car was done in that manner these tools were discarded, and resort

had to wetting the gold book leaf with turpentine, then laying it upon the gold; it would adhere nicely, so that when the gold was placed upon the size it would stick to that, the parts which did not strike the size would remain upon the paper to be put upon some other part of the scroll. By this means there was scarcely any waste, but we did not like the plan, and so took hold of another one, viz.: We first cut off the back of the book, then lifting the first paper leaf we rub it over lightly with a piece of wax or paraffine candle to give the paper a slight stickiness, then return it to the gold and gently rub it smooth; the gold leaf will adhere to every part of the waxed paper, and it may be placed anywhere on the size without making any loose leaf or waste. This plan worked well, and we saved a large lot of gold; but Mr. Wise did not like the new plan so well, for it prevented him from making an extra shilling, and, too, the work had to be washed with soap and water to remove the greasy film which was left on the face of the leaf. All our gilding is done in this manner now, and we have yet to learn a better plan.

For striping we use a patented machine consisting of a wheel covered with rubber, as a tire, and this, when rolled over the leaf, will lift and carry it to the size without waste. Wise uses a very durable gilding size which dries "tacky" in about two hours, but the drying quality may be regulated at pleasure. Take of light permanent wood filling, one pint; brown Japan, one-half pint; mix and thoroughly shake these together in a bottle. If wanted to dry quicker, add more Japan, and vice versa. The size should flow smooth without bubbles or fat edges, and the leaf must not be put on until the hand can be passed over it gently without sticking; but when placed directly upon it the size appears "tacky" or "sticky." If the size be too wet the gilding will be rough, and if too dry the gold will not adhere.

The Canada Pacific Railway.

A CORRESPONDENT writing from Ottawa, has inspected the extensions which have lately been made on the line of the Canada Atlantic Railway at the Capital. Up to last fall the line had only been completed to the northern terminus of Elgin street, some two miles distant from the extensive lumber yards of the Chaudiere. The work of reaching that point has been one of considerable expense, including rock excavations and heavy fillings or gradings, but in the month of December last this work was successfully completed and the track laid to within a short distance of the lumber mills, where they have now a number of sidings laid to accommodate the loading of several trains of cars simultaneously. In the new terminus at Chaudiere, a scene of great activity presented itself; an endless number of cars being loaded with lumber ready for shipment. At this point the company have secured a large area of ground which, when the sidings are all down, will give facilities for shipping the lumber with unprecedented rapidity, ordinary cars being loaded in an average of not more than half an hour's time. A walk through the yard of one of the prominent lumbermen of the city, sufficed to show that all the facilities which had been furnished by the company for the shipment of lumber were none too ample. The Canada Atlantic Railway is regarded as a great boon to the trade; never before have lumbermen been given such facilities for the shipment of their product. Heretofore great difficulty has been experienced in obtaining cars, whereas now a simple call to the head office of the company would secure an immediate supply. A new era in the lumber trade of the Ottawa Valley has dawned, and with the facilities now offered for its rapid shipment the year round—instead of the lumber firms, as formerly, having to avail themselves of the limited period of navigation in order to ship their products, and the lumber being thus taken in advance to the market, as it were, to be stored at the points of distribution, and which had a serious effect on the price obtained for it—the fluctuations and depression in the great lumber interest which were felt a few years ago are not likely to occur again, in so great a degree, at any rate, so far as the Ottawa Valley is concerned. Upon making inquiry as to the quantity of lumber shipped by the road, the record for March was given, which showed that an average of twenty-five car loads of twelve net tons each were shipped each day, or 150 car loads per week, and, in fact, recently 175 car loads were shipped within five days, or an average of thirty-five per day. As no foreign cars are allowed to leave empty, favorable rates of freight can be afforded.

Conventions.

JUNE 11.—Yardmasters' Mutual Benefit Association at Atlanta, Ga. Secretary, Joseph Sanger, Indianapolis.

June 11.—Railway Employés' Mutual Benefit Association. At Chicago. C. J. Ressegue, Chicago, Secretary.

June 17.—Association of Railway Telegraph Superintendents. At Boston. Secretary, P. W. Drew, Chicago.

June 18.—American Railway Master Mechanics' Association. At Long Branch, N. J. Secretary, J. H. Setchell, Cincinnati.

September 3.—Master Car Painters' Association. At Boston. Secretary, R. McKeon, Kent, Ohio.

September 10.—Roadmasters' Association of America. Indianapolis, Ind. Secretary, C. R. Meeker, Aurora, Ill.

September 16.—National Association of General Passenger and Ticket Agents. At Boston. Secretary, A. J. Smith, Cleveland.

October 8.—New England Roadmasters' Association. At White River Junction, Vt. Secretary, W. F. Ellis, Woonsocket, R. I.

October 15.—American Street Railway Association. At New York. Secretary, J. W. Richardson, Brooklyn.

October 22.—Association of American Railroad Superintendents. Semi-Annual Convention. At Washington, D. C. Secretary, Waterman Stone, Providence, R. I.

A NEW class of men has appeared in trade and are making their influence felt. These men are the high-priced men. They do business on the merits of their work. They do only the very best work, and strive to build up the name of being a high-priced house. It requires some courage to do this class of business, but we find these firms are invariably prosperous. Many people are sick of cheap houses and botch work. The man who thinks price alone governs trade, labors under a mistake. Price does govern trade with the poorest class of customers in the world, a disagreeable class to do business with, a class who want everything for nothing, and no amount of cutting in the world will satisfy them. They are often, too, the poorest paying class of customers in existence. We are glad the high-priced men are making their influence felt, and we have no doubt of their success.—*Ex.*

RAILWAY officials who contemplate adopting the best foot-guard for frogs and switches, will do well to address this office for full particulars of what is claimed to be the best device for the purpose yet brought out.

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

STREET TRAVEL IN NEW YORK.

THE history of the development of street travel in this metropolis during another month, presents features of special interest. A fight carried on with great determination at Albany, has resulted in the passage of one important bill providing for improved means of travel in New York. The contest over another, of perhaps equal magnitude in its potentialities, is not yet over. Enough has been done to show that the projected new cable traction system will not be operated by a company owning a monopoly of rights in the streets of New York. Competition will do something towards maintaining fairness of charges and good service.

The next months, and perhaps years, will witness an unprecedented confusion, we had almost said chaos, wrought by operations necessary to the provision of better facilities of locomotion in this great center of population. The public will bear it good-naturedly, of course, as they always do such things. Meanwhile the poor old car horse will continue to sweat and tug away his wretched life.

Improved cab service in New York may be said to have added a feature to metropolitan street life, making it more metropolitan looking, in short; and new vehicles are being added almost every day. What seems to be wanting to induce a more general use of the cab, is a tramrail which does less mischief to the roadway than that now in use. Were the streets of this city as level everywhere as they are on the thoroughfares having no tramways, the enjoyment of cheap cabs would be greatly extended. During certain hours of the day, the elevated railroad cars are most uncomfortably if not dangerously crowded. There is need for more than the promised variety of economical means of locomotion; and our good speed to every enterprise which promises improvement in this direction, will be seconded by a chorus of amens from this long-suffering public.

Editor American Railroad Journal:

DEAR SIR.—I have carefully read the communication from Mr. A. W. Wright, published in your issue of April, upon the subject of Iron versus Steel for horse railroad tracks. Knowing the careful study given by Mr. Wright to the various engineering problems that come to him, it is with much surprise that I note the conclusion he has reached, in favor of iron. I cannot help thinking that, after further and more thorough investigation, he will revert to his first belief in steel.

The problem is not a new one to me, either in its general bearing or in its particular application to street rails.

For many years I have been connected with the manufacture of iron, for the last year making a specialty of the Girder form of street rail at my own works. This question of iron versus steel was there forced upon me. As a result, after very careful thought, I have given up the manufacture of the rail out of iron (which step has closed the works), and contracted with a large steel works for the manufacture of the same out of steel. In plain words, speaking from the iron standpoint, I have gone over to the enemy.

It is somewhat hard to answer in detail, the communication from Mr. Wright. It appears to me rather a statement of a conviction on his part, than an exposition of the reasons which prompted that conviction. I will not stop to analyze the ingenious theory of the rack and pinion with infinitesimal teeth, for I cannot believe a question of this importance—and one which has, in other directions, been gone over so often before—can be ventilated to any useful extent by assuming theories for purposes of explanation. We want facts.

Mr. Wright seems to infer that the conditions of wear of a street rail are so different from those of a steam railroad rail, that what is applicable to one, is not so to the other. I cannot subscribe to this assumption, but, without discussing it, think we may weed this comparison out of the problem, as being irrelevant. The question after all resolves itself into, given: The *same* conditions of wear. Query: Which is the better material, iron or steel?

Before proceeding with the inquiry it becomes necessary to understand what we mean by iron and what by steel. There is iron and iron, and steel and steel. We cannot fairly discuss the question, or come to a conclusion that is worth a moment's thought, without settling what it is that we are comparing. What, then, are we to take as representing iron? Mr. Wright says *good* iron; this is too vague. One of the most serious defects of iron is just the point which renders some understanding about this necessary, viz., its irregularity. An iron can be made having an elastic limit of about 36,000 pounds and an ultimate strength of about 53,000 pounds; certainly *good*, as iron goes. We can secure this by the selection of old rails.

Rolling this into a tram rail, what is the measure of its average life?

Not ten years.

Another iron can be made with almost the same elastic limit and ultimate strength as the above, either from puddling or scrapping selected stock, the measure of whose life may reach, under the same conditions of wear, not less than eighteen years. This example is from practice.

Take a further proof of this irregularity.

Mr. Wright states, quoting Mr. Price Williams as his authority, that the average life of the best quality of iron rails is about 15,000,000 tons. As an extreme, against this averge, take the following. The Cambria Iron Co. have rolled iron rails that have made the average of 48,000,000 tons. I could add to these instances of the irregularity of iron almost *ad infinitum*. Which of the many varieties are we to take? Clearly not an article prepared for a given test; clearly not the very highest quality of iron which may be procured at an abnormal price. It seems to me that we should take as our article that which is commercially furnished in the United States today in the tram rail. If we are to take any specially prepared quality of iron, let us, as a matter of equity, take some specially prepared quality of steel (E. G. Whitworth's Compressed Steel) as a comparative article. If this conclusion be a just one, and I think it is, then the lesson taught by the experiments quoted by D. R. Clark (see Mr. Wright's letter) on the wear of iron rails, is not worth a row of pins.

The question before us is not whether the material called iron *can be made* with wearing powers equal or nearly equal to that of steel. As a matter of science there is no exact dividing point between the two, hence such could be done.

The question is whether the material called iron as in every day use, *is* made with wearing power equal to that of the steel in every day use. Against this ordinary and average grade of iron, what is the class of steel we must deal with?

Without discussing the many varieties of steel, we know that at least ninety-eight per cent. of the steel street rails are made from Bessemer steel and of that grade known as "rail" steel. In this we do not find the same irregularity as in iron. The large amount of business done in steam railroad rails has resulted in making this class of steel a well defined thing.

We have now defined, to a certain extent, our two articles. The question arises, how to compare them. It would be an easy matter to commence on a scientific plan, to give the various tests of stiffness, ultimate strength, etc.; we could give authorities of much weight on both sides of the question, and weave theories that would keep us talking until doomsday—after all to leave the question an open one. Open, that is so far as absolute and incontrovertible proof is concerned. We could do this and still be begging the question. It is one that cannot be dealt with or settled by any particular test or example, or settled by scientific discussion. It is one that will be passed upon by the common sense and the pocketbooks of the business man, rather than by the science of the engineer.

Let us assume for a moment that steel, as a material, is neither better nor worse than iron as a material. There yet remains a determining cause in its favor, and one of such importance that it alone would settle the dispute, viz., its homogeneity. Iron cannot be made homogeneous. I mean the iron we are talking about. I say this emphatically. The iron rail is composed of successive layers of iron piled upon each other, heated and rolled to shape. The ever-varying nature of the iron so piled, the varying working temperature of the furnaces, the contingencies of manufacture involving delays and, more than all, the very nature of the pile, necessitating lack of mobility of the particles, all contribute to make perfect welding difficult, and homogeneity an impossible thing.

Steel, on the other hand, is rolled from one ingot. Its welding has been done by nature, through chemical reaction, far more thoroughly than it could have been done by man's mechanical devices.

What is left? Either the admission that the article steel is superior to

iron, or the assertion that, treating of the material (I mean as a chemical composition), it is so much inferior to iron as to more than counterbalance the great advantage of regularity and homogeneity. Is this a likely task?

What is the history of steel versus iron for the past ten years?

Take it in steam railroading: it is there settled in favor of steel.

In ship plates, in bridge building, in cables, in gun manufacture, in agricultural implements, in the construction of all kinds of machinery, steel has been steadily and successfully replacing iron. And note this, in many of the above examples the problem is chiefly that of wear.

Dealing generally, take what experience has been acquired in the last nine years' use of steel street rails. It is true the exact and comparative wear cannot be given, but it is equally true that the fact that it *does*, under the same general conditions, largely *outwear* iron is already proved.

I think Mr. Wright's criticism on the value of the worn out rails is based on a misconception. The present value of old steel rails in this market is $19.00 per ton, about the same or nearly so, as of old iron rails.

Yours truly,

A. J. MOXHAM.

Editor American Railroad Journal:

SIR.—In the *Scientific American* supplement of March 22, Mr. F. C. Crowley, of New York, in an interview with a reporter of that paper, gives his opinions as to the difficulties and objections to the use of cable railroads in cities. It seems rather unfortunate that Mr. Crowley could not have extended his visit to San Francisco in order that he might have more thoroughly examined the method of operating street railways by cable as conducted here. In Chicago there is but one line, although of considerable length, and yet transporting an immense number of passengers; here we have seven lines operating under almost as many different conditions, some of the lines being on streets where but little traffic passes, while others, and those operated under the quickest speed, are running through streets having the heaviest traffic and teaming in the city.

With Mr. Crowley's general description of the construction of the road I have no criticism to make, only to say that local conditions in each city govern the construction; and what may be necessary to meet the conditions in our locality may be entirely unnecessary in another. In reference to other parts of his interview, I trust a fair criticism will not be out of the way. Commencing at the point where he refers to the slot of the tube, Mr. Crowley says that it cannot be safely crossed by horses, as the calk of the shoe gets into the slot, and that unless the shoe is raised vertically it is wrenched from the foot. That this may occur I admit, but that it *does* occur *often*, or that horses cannot safely cross the slot is *not* correct. We might as well say that horses cannot safely go along the paved streets of the city, especially the block stone pavements because they would slip down. We know that they do slip down, but I do not know that any person in New York City would say that horses cannot safely haul omnibuses up Broadway because even many fall down daily. All the horses in Chicago and San Francisco together which have been injured during the existence of cable roads, by crossing the slot of the tube would not amount to the injury to the horses doomed to a miserable existence while drawing street cars in one day in either city. Apply to Mr. Bergh for further information as to this.

Mr. Crowley says that the speed of the cars was very irregular, being six miles per hour at certain times of the day, and at other times only three miles per hour. I venture to assert that Mr. Crowley is mistaken, from the fact that the engines driving the rope of the Chicago cable road are by a celebrated maker, and the management of the road would not allow any such variation of speed. The greatest variation from the normal speed of any cable in San Francisco does not exceed five per cent., the average of all the roads being not more than two per cent., and the best less than one per cent. with the greatest fluctuation of work that can occur on the steep grades, when the power required is as much to draw one train up as eighteen trains on a level, and these changes from level to grade are excessive. It is not reasonable to say that such variations in speed as Mr. Crowley states can exist with the machinery in ordinary working condition.

Mr. Crowley says there is great interruption to travel by frequent stoppages, these occuring two or three times a day, and each from half an hour to several hours, which would, I should say, occupy the most of the day. We are well aware that the ropes wear; that is consequent upon usage, but that they break several times a day seems preposterous in view of the results in San Francisco. The following taken from the record of one of the roads in this city is the best answer that I can make. One rope was run 270 days, and during that time the total number of stoppages of the rope except at night were six, in all amounting to 149 minutes; another rope run 379 days and had four stops aggregating 340 minutes; another rope run 510 days, and had a total stoppage of 619 minutes, which included the time of putting it in when new.

The delays which Mr. Crowley attributes to the giving out of the grips or their bearings, or cars losing hold of the rope may exist to some extent in Chicago, but do not here except when a road is first started, and the men who operate the grips are all new and inexperienced. Here the cars are only moved by horses when they are switched off from the cable lines to roads having no cables. Although the cars are taken from one cable to another, and through switches and around curves, we don't find any use for horses for this purpose. Over two millions of passengers are carried annually on the cable railway cars of San Francisco, and the practical result has been that all parallel lines having cars drawn by horses have lost largely of their patrons when the cable lines have started, because the service by the latter was more rapid, efficient and regular than can be maintained by horses under any conditions which obtain here. The speed of the ropes in San Francisco varies from six to eight miles per hour, and the speed of the car can be maintained anywhere between that and stoppage without any difficulty. The cable cars do not run into any trucks or teams, being always able to slack up the speed or stop, as the case may require, always giving the teams ample time to get off the track; and this fact is so well known that some team drivers take advantage of it to annoy and retard the passage of the cable cars for considerable distances.

Here the cars are started without shock, and stopped gently. If the car instantly jumped to the speed of the rope, as Mr. Crowley says, all the passengers would be thrown from one end of the car to the other. Come out here, Mr. Crowley, and you shall be afforded an ample opportunity to examine thoroughly the cable system and its operation, and I feel satisfied you will change your mind, in some respects at least.

W. W. H.

SAN FRANCISCO, CAL., April 26, 1884.

THE Broadway Railroad Company completed its organization a few days ago with a capital stock of $75,000, electing as president, James A. Roosevelt, and secretary, Thomas F. Ryan. The company propose to build a surface railroad from Union square to South Ferry down Broadway. It has not yet been decided what power will be used, but it will not be steam. The cars will probably be run by pneumatic power. The company have obtained the consent of the Astor and Stewart property owners on the route, and are soliciting the consent of the others. The directors are: George Henry Warren, James A. Roosevelt, George G. Haven, William C. Whitney, Brayton Ives, Joseph J. O'Donohue, Wallace C. Andrews, Rowland N. Hazard, Thos. F. Ryan.

THE Brooklyn (N. Y.) elevated road is again under way. The managers expect some of the cars will be running on a portion of the track by next August, and that the road, seven miles long, will be finished by January, 1885. This road will connect the bridge and Fulton ferry with the Long Island system of railways, and the Brighton Beach, Coney Island, Railway. The capital stock of the company is $5,000,000.

WORK has begun on a street railway in Jamestown, N. Y. Five miles will be built in that village. Cars and rails have already been purchased of Philadelphia parties. It is proposed to extend the road three miles, to the junction of the New York, Pennsylvania and Ohio, Buffalo and Southwestern, and Dunkirk and Pittsburgh Railways. The stock, $100,000, is all held by local capitalists.

THE Chicago West Division Street Railway Company are using Lincrusta Walton for decorating the ceilings of their new cars. Quite a number have recently been turned out with this treatment. The effect is good, and receives favorable comment generally.

THE Chicago Crosstown Street Railway Company, of Chicago, Ill., has been incorporated; capital stock, $250,000; incorporators, Uzziel P. Smith, George G. Newbury and C. E. Felton.

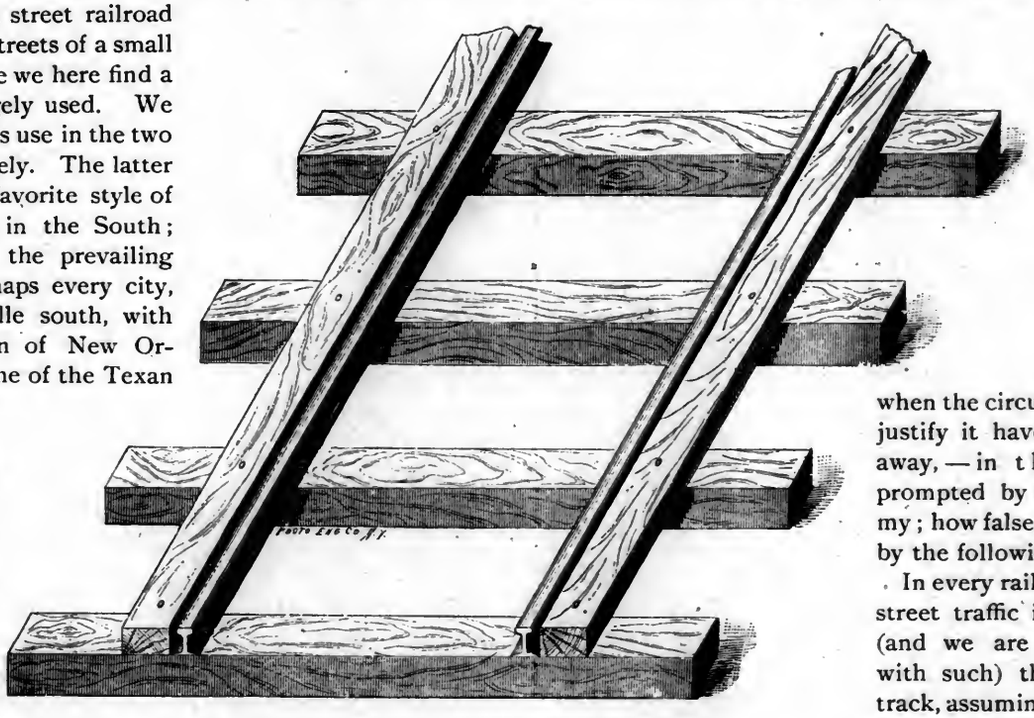
ACCORDING to the return made to the Controller, the gross receipts of the Sixth Avenue Street Railway Company for the month of March were $72,501.

THE first of a series of illustrated articles on Cable Railroads, from the pen of W. W. Hanscom, M. E., of San Francisco, will appear in the June issue of this publication.

On the Tee Rail as Adapted to Tramway Construction.

THE construction of a tramway is a compromise between two diametrically opposite considerations; hence, in its best aspect, it is an abortion as an engineering feat. First: Is the consideration begotten of its purpose, namely, the passage of the tram-car. Secondly: That begotten of its locality, namely, the necessity of its being non-obstructive.

We have repeatedly referred to, and drawn value from the steam railroad system. So far as the passage of a vehicle supported on flanged wheels is concerned, we can have no better; indeed, as an example, no other tutor. Here has been solved, so far as the present state of knowledge can solve, the problem of wheeled passage. It offers as the best type of construction, a Tee rail laid upon cross ties. The need of being non-obstructive is one that we have little to do with in the suburbs of a city, or in the first use of a street railroad in the main streets of a small town. Hence we here find a Tee rail largely used. We will look at its use in the two cases separately. The latter first: It is a favorite style of construction in the South; in fact it is the prevailing style in perhaps every city, from Nashville south, with the exception of New Orleans and some of the Texan cities. It is also used, but to a smaller extent, in many of the smaller cities of the West.



The drawing shown illustrates the general style of construction. The rail is joined by splices, laid on cross ties, and protected by guard timbers on the outside. As a general thing the rail does not weigh over twenty pounds per yard. At first sight this seems a serious error. To be within this weight it cannot exceed two and a half inches in height. Among other disadvantages thus induced are the following: A more or less buried head, a road-bed with the cross ties exposed, or, in a poorly constructed and badly drained street, both these evils.

If the head lies low the rail is dirty, the pulling hard, and the riding uncomfortable. A hard-pulling rail is a costly burden to a street railroad. It is one that eats up the yearly profits by a method that is insidious and certain. It largely increases the operating expenses. This is clearly shown in the extreme efforts made in the large eastern cities to secure a smooth, easy-pulling head, by the use of the heavy center bearing rail, the bulk of metal of which is put into the head for the purpose of increasing its height and lifting it above the surrounding dirt. Hard pulling decreases the paying life, and increases the yearly feed bill of the live stock and, by its continual jarring, rapidly depreciates the cars.

Why, then, its use? It is because of its constructive economy. A street railroad can be built with a twenty-pound Tee rail at a cost of about $3,200 per mile. It is unquestionably a fact that in many cases, particularly in the smaller towns, that a first investment in street railways is gone into as an experiment. Whether this should be so or not, we need not stop to inquire. Being so considered, it is argued thus: "Should the town grow rapidly, it is known beforehand that the Tee rail is doomed. It is an obstructive rail; with growth of the town comes large increase in the street traffic, and as a result, the need of a non-obstructive rail. This being so, it would be a useless waste to use a heavier rail. It would outlive its day. On the other hand, should the contemplated growth of the town not reach the expectations formed of it, the extra cost is but an addition to the loss that ensues."

These reasons prompt, and in some cases justify the use of the light rail. It is however a fact, that because of its use in the legitimate field here noted, this cheap style of construction is often adhered to when the circumstances that justify it have long passed away, — in these cases prompted by a false economy; how false, will be shown by the following:

In every railway where the street traffic is not a factor (and we are only dealing with such) the life of the track, assuming it to be kept in good repair, is measured by the amount of rail offered for wear. When this has been worn off and the rail has to be discarded, there is left a certain value of old material. The difference between the original and remaining value of the rail represents the cost of the use of the rail. We will call this wearing cost. Everything else, having lived its life, is absolute waste.

The problem of good construction may be expressed as an axiom. The wearing cost should bear the largest possible proportion to the total cost. Let us compare the light Tee rail with the Tram rail in this respect.

In the ordinary type of stringer tram track, the cost of construction under the circumstances we are discussing, would be about $5,200 per mile of single track; this, with a five-inch rail of steel, weighing forty-five pounds per yard, costing say $48.00 on the ground. When the rail has decreased in weight to twenty-eight pounds per yard it must be discarded. The wearing cost will then figure as follows:

WEARING COST OF 45-POUND TRAM RAIL.

Original cost per mile, single track, 70.70 tons at $48.00	$3,393 60
Discarded rail, 44 tons, at $20.00	880 00
Difference	$2,513 60

or 48.45 per cent. of the total cost.

With a Tee rail weighing twenty pounds per yard, and costing the same, which must be discarded when worn to fourteen pounds per yard, the wearing cost will be as follows:

WEARING COST OF 20-POUND TEE RAIL.

Original cost per mile of single track, 31.43 tons, at $48.00	$1,508 64
Discarded rail, 22 tons, at $20.00	440 00
Difference	$1,068 64

or 33.08 per cent. of total cost.

Thus it will be seen that as a matter of first construction the economy is much greater with the Tram than with the Tee rail.

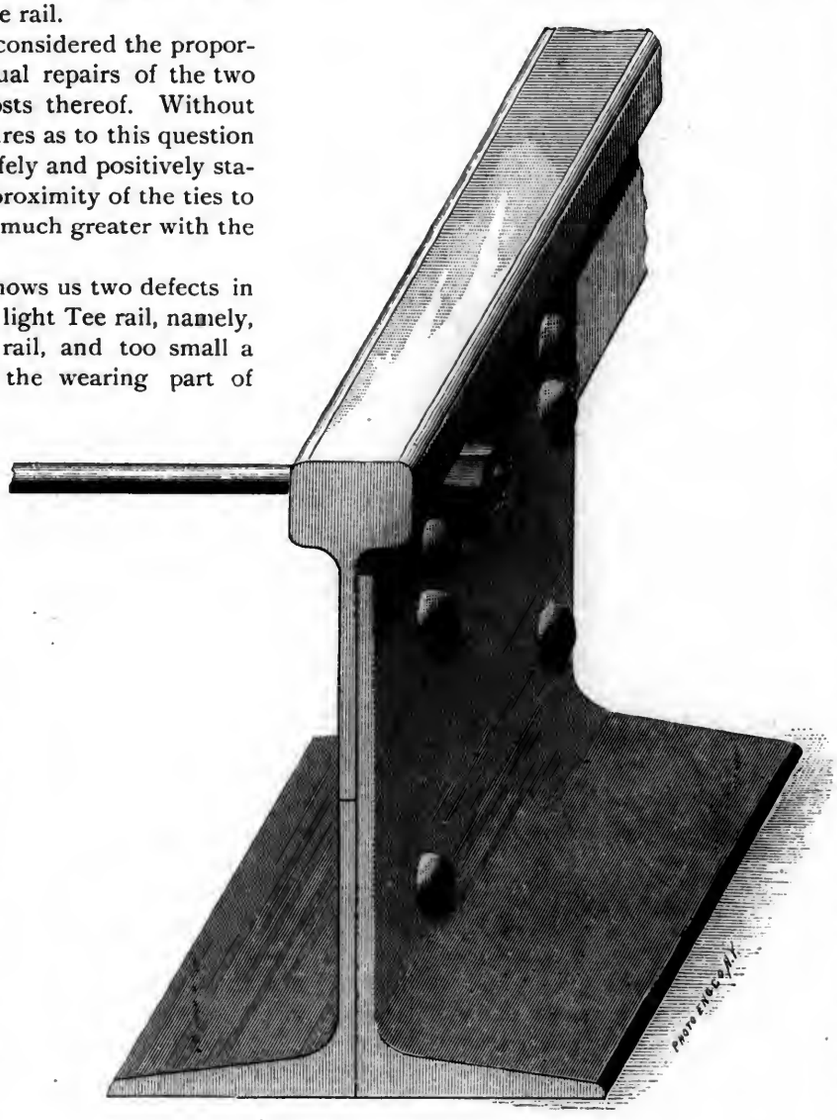
There is also to be considered the proportion borne by the annual repairs of the two systems, to the total costs thereof. Without going into detailed figures as to this question of repairs, it may be safely and positively stated that owing to the proximity of the ties to the surface, this cost is much greater with the light Tee rail.

The analysis so far shows us two defects in the present use of the light Tee rail, namely, lack of depth of the rail, and too small a quantity of metal in the wearing part of the same. Economical considerations will not permit us to increase the total weight, or both these defects could be thus remedied. Of the present design, a twenty-pound rail is too light to be really economical. The heavier the rail in the present type of design, the greater the proportion thereof devoted to the purpose of wear. Hence if we adhere to this design, a heavier rail is absolutely necessary to secure absolute economy. If the permanence of the investment is assured and a Tee rail decided on, nothing lighter than a thirty-pound rail should be used. The only and true province of the light style of construction we have been dealing with, is either where the construction is experimental, or where branch lines are pushed ahead of their time for purposes of occupation into territory which is rapidly growing, and when it is known that it must, before long, be replaced by the Tram.

In places where the growth, while slow is sure, a heavier rail is more economical. The writer can call to mind a street railroad so constructed, using a heavy Tee rail, where the useful life of the stock is from six to seven years, the running speed seven miles an hour, and the daily average per head of stock, seventeen miles. The nature of the road-bed accounts largely for this; it being a dirt or gravel road; but the smooth, easy passage of the cars and consequent light pulling for the stock is an equal if not more important factor.

The inference would seem to be that even where the light type of construction is necessary, the present type of rail might be improved upon.

See drawing herewith. The lower flange is entirely dispensed with; the metal thus saved is partly added to the web, increasing the depth and stiffness, and partly to the head, increasing the life of the rail. The greater stiffness permits the putting of the ties at greater distances apart. To secure a sufficient depth of ballast over the ties, they are thrown well down and the rail connected with same by means of a rolled chair. This chair is riveted or bolted to the rail, provision being made for expansion or contraction by making the holes oblong. The chair is spiked to the cross ties, and presents a much wider base than can be secured by the present rail. The track could be held to gauge by an occasional tie rod. A greater life of rail, together with a well ballasted way that would remain true to gauge, could thus be secured with but little if any greater cost than by the present means. The increased cost, if any, would be so slight as to be more than compensated for by the greater advantages of deep ties and fewer subsequent repairs. In England, and more particularly on the continent, a form of rail somewhat similar to the one here shown seems to have found some favor.



THERE is promise of great activity in railroad building throughout the South, in response to the demand for more extended transportation to meet the development of her timber and mineral lands. Many of the finest and most valuable portions of the country are comparatively unavailable on account of lack of transportation facilities, and it is for the interest of every farmer and producer to aid, so far as possible, in their construction instead of opposing and driving them away, and thus building up a few favored localities at the expense of the rest.—*Artisan.*

Method of Operating Trains on Cable Railroad.

THIS invention, by M. Paul Mayor, Lausanne, Switzerland, is designed merely to be applied on steep grades. It consists in a combination of the cable and locomotive system of propulsion on railroads, by means of a locomotive attached to one or to each of the trains connected by a cable, and moving in inverse directions on parallel tracks, one of the trains ascending, the other descending the grade.

As is the case on all cable railroads, the power created by the descent of one train is almost entirely utilized for the propulsion of the other train; and the resistance to motion of the train going up grade moderates the velocity of the other train, to an extent, in many cases, which the most powerful brakes could not effect; thereby contributing to the immunity from accidents on the steepest of grades.

The propulsive power of the locomotive of the down train will permit the latter, in its descent, to pass into irregularities of grade of the general incline, such as a reduced down grade, an intermediate level or an up grade, over which said train could not pass of its own weight. Thus for economy's sake, or for any other reason, the inclined railroad may be constructed with the above stated irregularities of grade, without rendering impossible the working of the trains, as otherwise would be the case on a cable railroad.

If the down train weighs less than the other train, the propulsive power of the engines of the trains will compensate for the difference of weight between the up and down trains. In fact, if the weight of the down train is no greater than that of the engine of the up train, the latter engine has then all the advantage of a stationary machine, namely, it loses no power in moving itself along the grade.

The loss of power, due to the fact that a locomotive has to use a part of its power to move itself with its train, is enormous on steep grades. It is generally admitted, in order to have no sliding of the driving wheels, that the weight of a locomotive must be equal at least, to eight times the resistance to motion due to the entire train. In this case, on a grade of 620 feet to the mile, a locomotive loses the whole of its propulsive power, and is capable only of ascending the grade without any other load. On a grade of 300 feet to the mile, an engine can draw a train equal to its own weight, and no more; and on as slight a grade as 200 feet to the mile, the weight of a locomotive has to be more than one-half the weight of its train.

If an unavoidable steep grade occurs on a common railroad, instead of augmenting the length of the line in order to lessen its grade, a cable may be laid down on the track along the grade. Then the locomotive working on the railroad, will also work the trains on the part of the line on which the cable is laid, thus saving the expenses of the construction of stationary engines. Moreover, a certain number of freight cars, or any other load, can be kept in reserve at the top of the grade, to be used as counterweights, to help express or fast trains which, coming to the foot of the grade, have no time to lose in waiting to run over the incline for another train coming from an opposite direction.

This mode of propelling trains on a cable railroad, by means of locomotives, does not exclude the use of a stationary engine, hydraulic or steam, or a water weight added to the train going down grade.

It is to be stated, also, that the tension of the cable is lessened by the propulsive action of the locomotive of the up train. Mathematical investigation shows also that the required weight of the cable is always much less on a cable and locomotive railroad than on a cable railroad worked by a stationary engine; for instance on a grade of 100 feet to the mile, the cable has to be twice heavier in the latter than in the former case.

The above able description is from the pen of the inventor, whose method as given, is protected in the United States by letters-patent granted to Paul H. Mayor, Owego, New York, February 5 of the present year.

Hill's Street Car Steam Motor.

THIS invention, of which full particulars may be had from Henry Metzger, of Williamsport, Pennsylvania. or Peter Herdic of the same place, has been tried with satisfactory results on the tramway in Williamsport. This is nearly three miles long, with six very short curves. The motor was stopped in the middle of a grade of fifteen inches to twenty-five feet, with a full load of passengers, and went up without any trouble whatever. Run when a foot of snow was on the track, it was found equal to its work.

Its construction is readily understood. An ordinary street car has mounted on its front platform a jacketed boiler, and under its rear platform a water-tank which is connected by means of pipes, with supplementary water tanks inside the car, and which have steam pipes running through them, like the tank previously mentioned. Connection is made between them and the other tank by means of pipes located near the rear end of the car. These pipes are provided with suitable check-valves. To facilitate the filling of the tanks inside the car, they are connected by means of a pipe, so that the water which is poured into one passes through the pipe and fills both. The closed tank under the rear platform is connected by means of pipes, with condensers situated near the opposite or front end of the car.

A leading advantage of Mr. Hill's motor is, that the machinery employed in it can be placed on the horse cars now in use. The machinery, which weighs about 2,500 pounds, and costs not more than six hundred dollars, is all out of sight; and the car is said to be noiseless in running, and no escaping steam or smoke is visible. All difficulties in running around curves and up grades are stated to be overcome by means of Mr. Hill's anti-friction roller attachment; and slipping is prevented by ingenious appliances which render his street car motor as well adapted for travel in winter as in summer.

Air Brakes for Cable Cars.

WE take the following from the *Mining and Scientific Press*, of San Francisco, Cal., issue of March 29.

It was found as soon as they began running cable cars in this city that the ordinary brakes on the wheels were not sufficient to hold the cars on steep grades, when the cable was released. A track brake was devised, which clamps down on the rails and effectually holds the car.

The brake-block is shod with soft wood, and is found to answer its purpose admirably. The only defect is that it does not work on both the dummy and car by the same operation. The dummy man has to ring for the conductor to put this brake on the car, so that time is lost; which, in an emergency, is quite important. The dummy man can only put on one pair of track brakes. On some roads he puts the track brakes on the car itself in operation, but not those on the dummy.

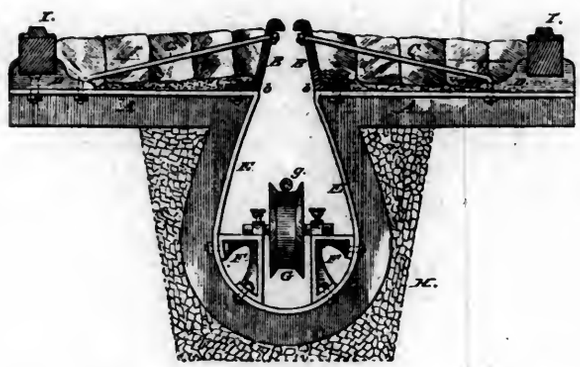
Recently we had an opportunity of examining an air brake invented by Mr. W. W. Hanscom, of this city, which is designed to overcome this difficulty. This brake is applied to one of the dummies and one of the cars of the Clay Street Hill Railroad Company. The object of this brake is to provide a means whereby the brakes on both the car and the dummy can be operated by the gripman on the dummy without having to call or signal the conductor to put on the brakes of the car; for in many cases, in the busy streets of the city, such as the lower parts of Market, Geary and Sutter streets, the conductor's time is mostly occupied in attention to passengers, and the application of the brake on the dummy alone will not stop the train as promptly as is desired. At the time that Mr. Hanscom was engineer of the Presidio Cable Road he saw the necessity of placing the entire train brakes under the control of the gripman on the dummy, and he immediately went to work to study up what should meet the requirements. The air cylinders for operating the brakes are placed underneath the car, and a piston-rod from each end of the cylinder takes hold of a bell crank lever, on one end of which is fastened a wood shoe, which is forced down against the track, forming a skid or track brake. On the dummy is a similar cylinder, and connected in a similar way to the track brakes of the car. The cylinders have air pipes running to each end of the car, and are provided at each end with a cock for closing the end of the pipe when the opposite end of the car is connected to the dummy, so that either end of the car may be connected with the dummy or another car may be attached to the train.

The pressure of air for operating the brakes is generated by an air pump, operated by the foot of the gripman whenever desired, no reservoir for the storage of compressed air being used. By properly proportioning the pump and cylinders the action of the brake is wonderfully prompt, and the brakes on both car and dummy are simultaneously acted upon, two seconds only being required to bring them into action. The simplicity and efficiency of this air brake will commend themselves to those who desire an additional safeguard from accident to those crossing in front of the dummy, and a more perfect control of the train than has hitherto been possible.

DR. BOLT, an Irish astronomer, says the length of the day is constantly increasing, but in a few centuries the change is but a fraction of a second. This information should greatly encourage mechanics who want an eight hour law, in order that they may devote a couple of hours each day to improving the mind by studying books, playing pool, etc. Ten thousand years hence the days will be a couple of hours longer, and this extra time may be devoted to mental improvement after working ten hours a day.—*Norristown Herald.*

296,667. CONDUIT FOR TRACTION-ROPE RAILWAYS: ZACCUR PRALL BOYER, Philadelphia, Pa., assignor to the United States Cable Motor Construction Company, of New Jersey. Filed Feb. 25, 1884.

Brief.—A traction-cable-conduit girder of rolled iron or steel having the horseshoe configuration at its center, and the horizontal wings formed at an acute angle to said central portion, whereupon are supported the slot-irons, and at the outer ends of said wings the track-rails.



Claim.—1. In a conduit for a traction-rope or endless-cable railway, the iron or steel yoke A, of the form approximately of a horseshoe, and having wings extending horizontally therefrom at nearly a right angle, forming level bearings, as at *b*, adapted to receive and support the metallic beams B B, said yoke being rigidly held in position by means of concrete H, all constructed substantially as set forth and described.

2. In conduits for traction-rope or endless-cable railways, yoke A, formed of a single T-rail, or any single rail of iron or steel of the shape shown, bent into the form described, for the purpose of encompassing the walls or sides of the conduit or tubing and also to serve for rigidly holding in position beams B B, chairs D D, and supports F F, constructed and arranged substantially as specified.

3. In a conduit for a traction-rope or endless railway, the combination and arrangement of yoke A, constructed of wrought metal, as described, with wings extending horizontally therefrom at nearly a right angle, and forming bearings *b*, beams B B, connecting-rods C C, and chairs D D, all operating substantially as set forth and described.

THE superiority of *Cassell's Family Magazine*, as a cheap, and, at the same time, elegant embodiment of wholesome and entertaining reading, has been fully established. It has a large circulation in both Europe and America, a fact in every way gratifying to intelligent and right-minded people. Its continued and short stories are meritorious, and its miscellaneous contents cover all the best features of modern magazine literature. Numerous illustrations enhance the many-sided desirableness of this monthly periodical. New York: Cassell & Company, 739 and 741 Broadway.

"ZEPHYRS from the Sea-Shore and Mountain Resorts of the Chesapeake and Ohio Railway" is the title displayed in the vignette of a very handsome and interesting paper, issued by the Passenger Department of the Chesapeake and Ohio. The first number for this season will be out on June 1st, and may be obtained by addressing "Zephyrs," Passenger Department Chesapeake and Ohio Railway, Richmond, Va. The paper will be issued semi-monthly during the summer season, and will be devoted to the society news from the Summer Resorts on the line of the Chesapeake and Ohio.

MIXTURE FOR CLEANING PAINT.—Dissolve two ounces of soda in a quart of hot water, which will make a ready and useful solution for cleaning old painted work preparatory to repainting. The mixture, in the above proportions, should be used when warm, and the woodwork afterward washed with water to remove the remains of the soda.

Lubricating and Lubricants.

BY E. F. DIETERICHS, CLEVELAND, O.

V.

ON FIRE-TESTS AND HEATING OF LUBRICANTS.

THE claim often made for a lubricant, that it is of superior quality on account of its very high fire-test, does not appear to have foundation in fact. The fire-test of a lubricant should be in exact proportion to its ability to absorb frictional heat as fast as it is generated, and should enable it to vaporize and transfer the heat into space before an increase and undue accumulation of it can take place.

On every bearing where metallic surfaces move in close contact with each other, the resulting friction constantly produces heat, and if not removed by lubricating, this heat will accumulate on the metal, cause its expansion and abrasion, and arrest the motion. To prevent this and to ease the motion, we put between the moving metallic surfaces such substances as are able to absorb the heat and vaporize with it into space. The higher the vaporizing temperature (the fire-test) the longer will this frictional heat be retained in the lubricant and on the metal, and thus a lubricant of highest fire-test will have to absorb heat to that high degree before any particle of it can vaporize and transfer the frictional heat into space. The amount of oil thus vaporized, and the constantly proceeding vaporizing process is at any point of time of so small a scale as to be almost imperceptible to our limited senses, but we can judge as to the fact by comparing the lowering or increasing temperature on such bearing with that of the surrounding atmosphere, from the total disappearance of nearly the whole of the amount of lubricant used there during a period of time, and the well-known fact that vaporization cannot be caused without applying heat, and continuous vaporization can only be maintained by continued application of heat.

It then follows that the higher fire-test of a lubricant is by no means an indication of its better qualifications as such, and if we are able with an equal quantity of lubricant of lower fire-test to keep the temperature on the bearing proportionately lower also, the latter lubricant must be the more efficient and economical one, aside from the important fact that the lubricants of highest fire-test are compelled to become decomposed under the influence of constant exposure to that amount of heat which they are obliged to absorb and hold, ere they attain the temperature at which they can vaporize.

Cylinder-oils should have a fire-test low enough to allow their ready vaporization under the frictional heat they have to remove from the metallic surfaces in the cylinder in motion and contact with each other, and escape with it into space through the exhaust; and only high enough to allow clinging to the metal, without being decomposed or too rapidly vaporized by the high but moist temperature, and uselessly blown out by the steam.

Many things are done from mere habit without for a moment considering the cause or the result of the action. It is so with the almost universal and persistent custom of engineers and mechanics to keep their oil cans in warm places on the cylinder-chest or heater, no matter what kind of oil they may be using. This undoubtedly arises from the fact that most oils for lubricating are either reduced mineral oils, fatty oils, or mixtures of both, all of which readily congeal, and therefore require to be kept in warm places in order to have them ready for immediate application. This becomes such a habit with engineers that they will treat and look upon all kinds of oils in precisely the same manner; and oils that flow freely at all temperatures, and oils that require previous heating to become limpid enough for application can be seen standing side by side in the hottest place in the engine-room. No thought is given to the fact that every degree of temperature thus forced on an oil, previous to its application, above that which is necessary to keep it fluid, is a waste of its lubricating power and consequent needless increase of cost. Oils of high fire-test congeal at lowering temperature, and require the accumulation of considerable heat before they can be easily applied for lubricating, and they leave gummy deposits. Lubricants of lower fire-test do not thus congeal; they retain their consistency nearly uniform at all temperatures, and their preliminary heating is therefore an absurd practice—simply a habit, and positively contrary to reason.

When we consider that lubricating means the removal of frictional heat produced by motion, as fast as it is produced, or in plainer words, "to keep the bearing cool," we will have to admit that the lubricant applied at a temperature equal to the surrounding atmosphere must be able to absorb and dispose of more frictional heat than one that has been heated some hundred degrees or more previous to being applied; and the heat on the bearing must increase and accumulate until it reaches the temperature at which the lubricant was applied, and then only the real working of the latter can begin and absorb the further increase of heat, and dispose of it at its vaporizing point.

This accumulation of frictional heat, though almost imperceptible to ordinary observation, means increase of friction and dragging on the machinery, thereby causing loss of power, increased wear and cost. This waste is in exact proportion to the uncalled-for increase of heat forced upon the lubricant, and depriving it of a valuable portion of its lubricating power. The astute engineer then gives his verdict that the oil was not good, that it was running dry if not lavishly applied, and that it took more of this oil than of some heavy, greasy oil that may be his favorite.

An oil to do efficient and economical work should, under all circumstances, be applied as cool and direct as possible to the place where it is expected to do the work, and should be of such fire-test and consistency as to allow it, at all temperatures, to cling to the metal, absorb the frictional heat, and radiate with it into space as fast as it is produced.

(*To be continued.*)

DEAN BROS., Indianapolis, Ind., have furnished the Rust Owens Lumber Co. at Drummond, Wis., with a system of water works, including pumping machinery, pipe and hydrants, having a capacity of one million gallons in twenty-four hours.

THE Louisville, New Albany and Chicago Railroad Co. have just received four new freight engines from the Rogers Locomotive Works, of Paterson, N. J.

Our English Letter.

WRITTEN SPECIALLY FOR THE AMERICAN RAILROAD JOURNAL.

PORTABLE RAILWAY PLANT—LIGHTING RAILWAY CARRIAGES BY ELECTRICITY—RESPECTING STEAM TRAMWAYS—THE LONDON AND NORTHWESTERN RAILWAY COMPANY AGAINST THE NANTWICH ASSESSMENT COMMITTEE — PROPOSED DUPLEX BRIDGE ACROSS THE THAMES—THE RUSSIAN SCARE AND SOME OF ITS CONSEQUENCES—FALLING OFF IN IRISH RAILWAY BUSINESS — SOME NOTABLE NEW INVENTIONS — THE KILLED AND WOUNDED BY RAILWAYS IN 1883.

A NOTABLE exhibit at the late exposition in Calcutta was a portable railway constructed and shown by Mr. W. G. Bagnall, of the Castle Engine Works, Stafford, together with a complete rolling stock. The line was laid around the lake and was two feet gauge. It consisted of sixteen pound steel rails in ten feet lengths, secured to channel sleepers by means of clips, which fitted up close to the web of the rail. The inside clips were riveted with two half-inch rivets, and the outside clips bolted with two half-inch bolts. By this arrangement the whole can go away in parts to save freight, and the cost of bolting on arrival does not exceed £5 per mile, and when done, the railway is equivalent to a portable riveted railway, and extra sleepers can be fixed at any point where the ground is not sound. There are three sleepers of channel iron, two feet nine inches long by four inches wide to each ten feet length, and a joint sleeper five inches wide, so that no fish-plates are required. Mr. Bagnall is of opinion that the sleepers should project beyond the rails, the extra length amply justifying the extra cost. The weight per mile of the railway is about thirty-eight to forty tons, and the value about £400 per mile. The exhibit included eight wagons of various descriptions, bogie and otherwise, suitable for carrying sugar canes and other colonial produce, and also three passenger cars and a locomotive. The locomotive has cylinders five inches in diameter by twelve-inch stroke; the four-coupled wheels are of solid steel, fifteen inches in diameter, with a leading pair of bogie wheels twelve inches in diameter. The rigid wheel base, from the trailing axle to the pin of the bogie, is three feet seven inches, and the flexible wheel base is seven feet. The engine will pass round curves of thirty-five feet radius. The weight on the bogie wheels is adjustable, and the total weight of the engine in working order, four and one-quarter tons. The tank is placed behind the foot-plate, and the boiler fed by an injector, and by a triple valve pump worked by an eccentric. The brake locks the four-coupled wheels. The fire-box, which is constructed for burning wood, is of copper, and the tubes of brass, the total heating surface being ninety square feet, of which twenty-one are in the fire-box and sixty-nine in the tubes. The grate area is 2.04 square feet, and the working pressure 150 pounds. There is an awning over the driver, with a spark-arrester in the chimney, and an ash-pan to hold water. The engine is capable, in ordinary work, of hauling loads of forty to fifty tons on a fairly level road. To railroad men nothing could be more interesting than this exhibit, evidencing great possibilities not only in exploration and commerce, but also in war.

Mr. W. H. Massey, of Twyford, Berks, consulting engineer to the Royal Household, has made experiments in lighting railway carriages from a dynamo driven by a separate engine supplied with steam from the locomotive. The results of his researches were recently brought before the Society of Telegraph Engineers, and Mr. Massey expressed his confident opinion that the cost of lighting by this means is considerably less than gas; indeed his experiments demonstrated it to be some thirty per cent. less than gas at twelve shillings per 1,000 cubic feet, and this with about double the amount of light supplied. At least one eighteen-candle lamp should, in Mr. Massey's opinion, be given to each compartment, as one five-candle lamp is too small to yield a reading light. In the opinion of *Engineering*, Mr. Massey has demonstrated by a practical test that the electric light may be supplied in railway trains at a cost rather less than the best gaslight systems now in use, and with a gain of about double the illuminating power. Pintch's and also Pope's compressed gas costs from twelve shillings to fourteen shillings per 1,000 lamp-hours, whereas an electric light of twice the candle power can, in Mr. Massey's opinion, be supplied for eleven shillings per 1,000 lamp-hours. Moreover, the first cost of gas apparatus is nearly double that of the necessary electrical plant. Mr. Massey, writing to your contemporary, says: "In estimating the working cost of the electric light for trains it would be well to remember that the 1,000 lamp-hour unit is the most convenient, and that fifty lamps of twenty-candle power each are required for the great majority of trains, whether these are short and brilliantly lighted, or long and only fairly well lighted."

Mr. J. Compton Merryweather, of Greenwich, writes to the *Times*: "By the adoption of properly constructed tramway locomotives it is conclusively shown in daily experience that steam is doing the work on certain lines at half the cost of horse traction—thus at Stockton the steam street tramway is costing three and one-half pence per mile, while at Dewsbury the figure is almost identical. These lines have been open for two and six years respectively, and are, therefore, not experimental. Horse traction would cost under the same conditions five and one-half to six pence. At Rouen there are roadside steam tramways which have been working for the last five years or more. Again, in the streets of Barcelona such tramways are in work, as also in many parts of Holland, India, Rangoon, etc. I am mentioning merely one or two steam tramways with which I am connected, but there are other lines doubtless as successful in their cost of working."

Your correspondent supposes that squabbles between railway corporations and local authorities take place in the United States as they do here. A late instance of the kind is that the London and North Western Railway Company has entered an appeal at the Cheshire Sessions against an assessment made by the Nantwich Assessment Committee, increasing the charge on the company's property in the Union, from £53,000 to £94,000. The appeal will be heard next sessions.

The Marquis of Hartington has consented to receive a deputation of working men in favor of the proposed duplex bridge, which it is proposed to construct over the Thames near the Tower for free communication across the river, without impeding the passage of vessels. The plans of the bridge bear evidence of considerable ingenuity. Towards the center there is a double way, so that traffic may pass uninterruptedly on one side, whilst the other side is being raised to permit the passage of a vessel.

Russian and British interests clash, or threaten to do so, and John Bull is in earnest to prevent what we call "Russian aggression" at our expense. As examples of practical suggestions looking to this end may be mentioned that General Sir Lewis Pelly, lecturing at the Royal United Services Institution, recently, enlarged upon the dangers of Russian aggression in the direction of India, and, pressing the necessity for an alternative route, urged the advantage of a railway from the Mediterranean to the Persian Gulf, where could be found a convenient point from which to commence the prolongation of the railway to Kurrachee. The length of the railway proposed would be 850 miles, and the cost about £9,000,000 sterling, which, he urged, should be a line under guarantee from the British Government. Moreover, Captain Molesworth, R. N., presided at a meeting of the subscribers to the Jordan Valley Canal Fund, at which the following resolution, proposed by Mr. Edmund Kimber, was carried unanimously: "That in view of the recently issued Russian loan of £15,000,000 for the purpose of contracting their railways through Persia to the Persian Gulf, and from Batoum to Bagdad, as well as to Merv, it is more than ever necessary that the opinion of leading men in India in favor of the Jordan Valley Canal should receive an early and practical response in this country, so as to strengthen and ensure our highways to the East, and therefore this meeting is of opinion that the estimate of the Anglo-American and Anglo-Indian contractors should be at once sent in."

The following figures are interesting as showing how Irish disaffection has affected the railway returns of that unhappy country. The figures represent returns for the first thirteen weeks of the present year, for the mileage given, compared with the corresponding weeks of last year:

	Passengers.	Goods.	Total.	Mileage.
1884.....	£198,862	£221,504	£420,366	1,447
1883.....	207,754	245,813	453,567	1,447
	Dec. £8,892	*Dec.* £24,309	*Dec.* £33,301	.....

I notice some newly-patented improvements, of which your readers will be glad to know something. A new railway wheel is cast in two parts, the tire and arms being cast in one piece, the nave or center forming the other piece; these two parts are bolted together, the arms and the nave having L-shaped (in section) extensions which fit together. In rails and sleepers for railways, depressions are formed in the tops of the sleepers to receive the bottoms of the rails, and the sides of the depressions confine the rails and receive a large part of the lateral strain.

An important invention relates to the construction of tunnels and subways of tubes and masonry in or under water, to the manner of weighting and joining tubes to ordinary masonry, and to machinery therefor; a chamber larger than the tube in transverse section is supported on wheels or rollers or slides against a portion of the tube to be extended, and is forced forward by screws or hydraulic pressure, the material in front being excavated by machines within the fixed tube or chamber.

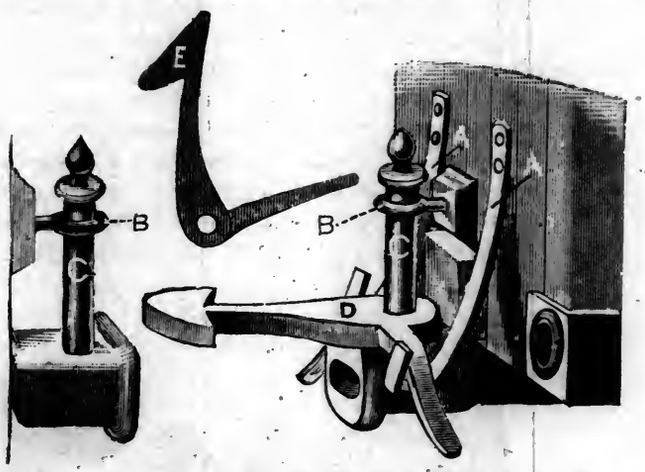
Turning to a less desirable subject: The total number of personal accidents reported to the Board of Trade by the several railway companies during the year 1883 amount to 1,230 persons killed, and 8,123 injured.

H. A. L.

New Inventions.

Bond's Car Coupling.

THE coupling illustrated, patented by C. W. Bond, Toledo, Ohio, aims at uniting cars of different heights by placing the coupler above the present drawhead and without altering it, so that, if desirable, the link can be used



as heretofore. To secure proper strength, the top of the elongated pin is braced by a movable brace which passes through the car, and moves in harmony with the drawhead. The shock or strain is relieved by a spiral spring inside the car. All that is required to adapt the car to the coupling, is to make a hole for the brace to play in, and the coupler is moved from one car to another, by simply withdrawing the pin. In coupling a higher to a lower car, the coupler is placed on the higher one.

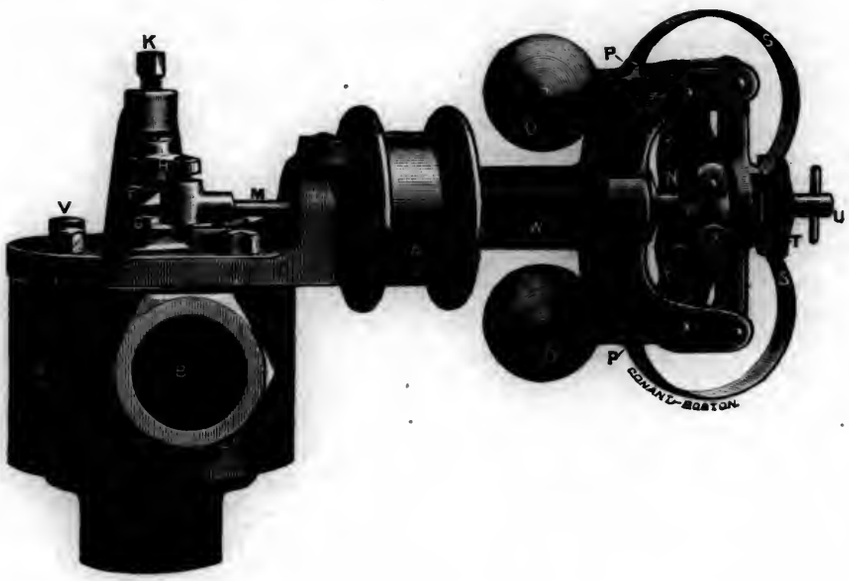
Mr. Bond's device presents two spring rods which hold it in position, a brace to strengthen the pin, a pin which passes through the drawhead, and a coupler with two handles projecting nearly to the sides of the car and resting in the spring rods, thus holding the coupler in position and providing, by their being moved, for the uncoupling of the cars. A coupler with single fluke can be substituted for an arrow-headed one, and one handle instead of two as described, can be provided.

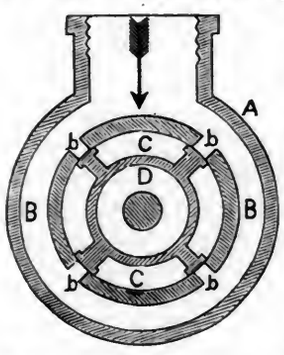
THE well-known Philadelphia firm of Riehle Brothers, have been the recipients of several valuable and important orders for their specialities. Their testing machines are believed to have no superior, and are the acknowledged standard. The manufacturers have recently entered orders for the following: One 100 ton testing machine for chain; one 40,000 pound testing machine for testing springs for the Atchison, Topeka and Santa Fé Railroad, besides several foundry, wire and cement testers. The latter have been adopted as the standard by the Board of Public Works of New York city. Riehle Brothers have furnished their celebrated patented furnace charging scale to the Sharon Iron Company, New Jersey Zinc and Iron Company, and J. C. Beatty and Company, Sterlington; one power hay and straw rope twister goes to Birmingham, Alabama. Goods have been shipped to foreign countries, even as far as Japan. The testing machines of Riehle Brothers have been approved by the British Lloyds and Bureau Veritas, and are qualified to test for vessels made under the rules of these companies.

Wright's Steam Engine Governor.

THIS Governor, manufactured by the Wright Machine Company, Worcester, Mass., is well represented in the accompanying cuts; the construction of the valve stem, by which a steam tight joint is secured, thus doing away with the use of packing, is a feature which will be appreciated by practical engineers.

It is driven by a pulley R, attached to the revolving ball standard W. This standard has two slotted arms X X, in which the ball arms are pivoted, and which also support the cross bar; the cross bar is a support for the flat bow springs S S, which control the action of the balls by pressing them inward, their tension being regulated by the adjusting screw U, which presses the plate T upon them, and so varies their pressure upon the arms at the points P P, giving a wide range of adjustment without lessening the full volume of steam when the full power of the engine is required. As the weight of the balls is not depended on as in most governors, light balls are used, running at a high speed, making it very sensitive, and enabling it to run in a horizontal position, thus avoiding the use of a driving shaft and gears, and making it very compact as well as noiseless.





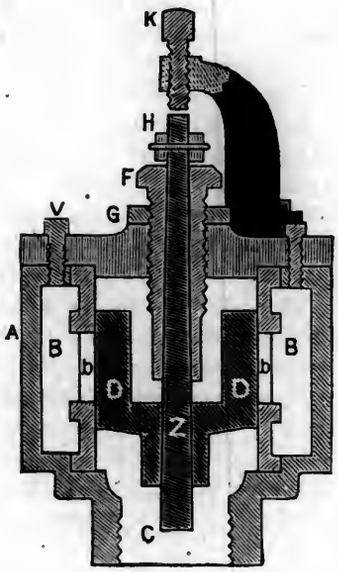
In the forked ends Y Y of the ball levers, are loosely pivoted blocks which revolve in a groove in the head N, fastened to the rod M. As the balls are forced outward and inward, the rod M is moved downward and upward, closing or opening the valve by means of the lever H, which is attached to the valve stem.

The valve stem is slightly tapered, and fits a correspondingly tapered seat in the screw F. The pressure of the steam causes its upper end to press upon the screw K, by which it is so nicely adjusted to its seat as to prevent both friction and the escape of steam, making a steam-tight joint without packing. The annoyance of frequent packing is thus avoided. After the screw is once properly set, it will need no further attention.

This arrangement of the valve stem, together with the quick speed of the balls, and their great freedom of action consequent upon the arrangement of the springs, and their indirect action upon the valve through the lever H, makes the governor very sensitive to slight variations of speed.

The Martin Car-Coupling.

THIS invention, by John Martin, of Knight's Ferry, Stanislaus County, California, relates to a car-coupling of that class in which swinging latches on each draw-head are adapted to fall into engagement with the ends of heads of the coupling-pin. It consists in a peculiarly constructed draw-head chamber, in a staple secured to the under side of the gravitating latch, adapted to receive and throw



out the coupling-pin when necessary, and in the means for raising the latches from above or on the side to uncouple the cars. The object of the invention is to provide a simple and effective automatic car-coupling, which shall be able to readily uncouple itself in case of accident, or be easily uncoupled by design.

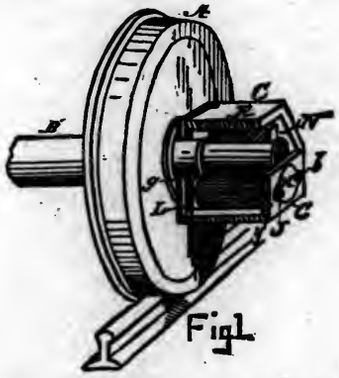
Described with some detail, the Martin car-coupling has a chamber between the draw-head and a hinged latch. This chamber has a front shoulder for the reception and engagement of a coupling-pin. Means of raising the latch consist of pivoted arms, levers, bail and rod. A staple in the latch receives the point of the pin, which is freed when the latch is raised, whether by accident or design. In the case of a derailment, for example, in which the relative position of adjoining cars would be changed, the raising of the latch would throw the coupling-pin out, and uncouple the cars. The means for raising the latch, as before mentioned, are arms on the latch, levers on the draw-head, the bail upon the sides of which the rear ends of the levers play loosely, and a rod. The coupling may be accomplished by the brakeman from either top or side. The other part of the device, namely, the opposite draw-head, is a duplicate of the part described, and the coupling-

pin is alike at both ends; but if a car provided with the Martin coupling should have to be used with a car having the old style upon it, the inventor suggests that a pin could be made with a conical head at one end and a link or slotted head at the other.

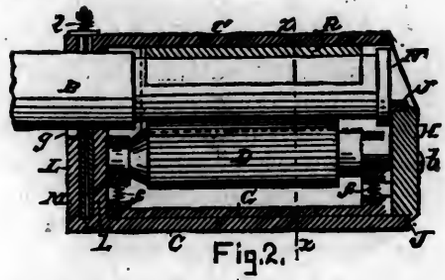
Mr. Martin's ingenious devices are protected by United States letters patent.

Oiler for Car-Axle Boxes.

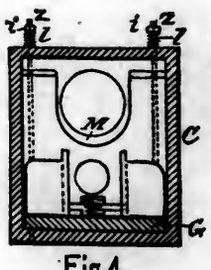
THE improved box invented by George K. Waterhouse, No. 162 I street, South Boston, prevents the axle from heating, and obviates the necessity of packing with waste.

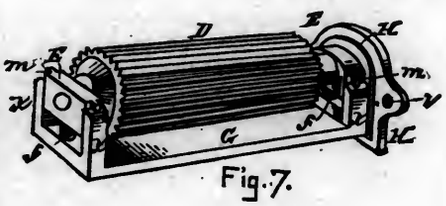

Fig1.

It will also prevent dust from entering the box and cutting the axle, and thus save a great expense to railroads. The improved boxes are of the standard size and can be applied without any changes, thus making a large saving in the expense of lubricating the axle.


Fig.2.

In the accompanying illustrations, figure 1 is a sectional view showing the improved oiler as applied to the axle; figure 2 is a vertical longitudinal section; figure 4 is a vertical tranverse section, and figure 7 an isometrical perspective view of the oiler detached. A represents the


Fig.4


Fig.7.

car wheel, B the axle, and C the box. The oiler proper consists of a cylindrical roller D, journaled horizontally in the boxes E E, which are fitted by means of the ways *m* to slide vertically in the standards *x x*, and provided with the coiled springs *f f*, as best seen in Fig. 7. The standards are connected at their lower ends by a bed piece G, which is attached at its outer ends to the face-plate H, provided with the screw holes *v*. The bed G, provided with the standards *x* and face-plate H, and carrying the boxes E and springs *f*, constitutes a carriage for the roller D, and also a cover for the opening J, which is formed in the outer end *y*, of the axle-box C, and through which the oiler proper is introduced into said box, as best seen in Fig. 2. The rear end of the axle-box is double or provided with two walls L L, and adapted to press against the lower side of the axle. There is a curved plate M, at the upper side of which are attached two rods *z z*, provided at their upper ends with the nuts *i i*, and with coiled springs *l l*, which rest on the top of the axle-box and act expansively against the nuts, so as to constantly draw the plate upward and against the axle. The springs *f f* act expansively to force the roller D in an upward direction, and to keep it in constant contact with the axle B.

In the use of the improvement, the oiler proper, as shown in Fig. 7, is introduced into the axle-box through the opening J, and secured by means of the screws *b* passing through the holes *v* in the plate H, into the outer end of the box. The box is then properly filled with oil, through an opening at N. The quantity is sufficient to partially submerge the roller D, or so that when the axle revolves, the roller which is in contact therewith and is revolved thereby, will take up the oil and lubricate the axle in a manner which will be readily understood by all conversant with such matters, without a more explicit description. The object of the plate M is to pack the axle at the inner end of the box in such a manner as to prevent the dust or dirt from entering the box through the opening *g* beneath the axle. The bearing of the axle R is placed in its usual manner. It will be obvious that the axle will be constantly supplied with oil by the roller D, and thereby be prevented from heating, and that Mr. Waterhouse's improvement entirely obviates the necessity of packing, or stuffing the box with cotton waste, in the usual manner, thus making a very large saving in the expense of lubricating the axle.

The Automatic Center Car Brake.

THIS brake is an attachment which does not interfere with the brake now in use. A vertical shaft with crown wheel is fixed under the car, to which are attached chains to tighten the brake shoes also attached to it, so that said chains can be wound taut. The shaft is made to revolve by means of another shaft fixed lengthwise of the car, and is provided with a small pinion to turn the crown wheel. At both ends of the longitudinal shaft there are clutches, providing that the brakes of a train can be coupled and operated together. Both ends of the longitudinal shaft are square, with a spiral twist, and have shoulders, between which and the clutches are spiral springs employed to press outward on the clutches. In coupling cars, should it be the case that the clutches are not exactly in the right position, they will slide back on the shaft with a turning motion caused by the spiral twist at the end of the shaft, until they will "mesh" together, when the spiral spring immediately presses the clutches forward into the position desired. The longitudinal shaft extends under the platform of the locomotive, where it is in connection with a small stationary engine placed conveniently for the engineer. This engine is intended to

furnish power with which to work the brakes, and is always ready when the locomotive is on duty. A piece of mechanism to register the number of revolutions the shaft has been wound up is placed in the cab of the locomotive, enabling the engineer to reverse said shaft to its former place. The clutches may be made to fit different-sized cars by the adoption of a proper standard from the track; and the clutches are said to operate perfectly on sharp curves.

Alfred A. Lambrigger, of Big Horn City, Johnson county, Wyoming Territory, is the inventor and patentee of the device described.

Oiler for Loose Pulleys.

THE oiler for loose pulleys invented and patented by W. D. Greaves, Jr., Presque Isle, Maine, is made by him as follows:

He drills into the end of the shaft as far as the middle of the loose pulley bearing, and then drills a smaller hole through the shaft crossing the end of the first. A wick is then inserted in the holes, which dips into an oil cup tapped into the hole at the end of the shaft.

Although it may appear difficult at first to drill so far into the end of the shaft, this is easily accomplished by hanging the shaft where it is going to run, or in any convenient place, and so belting it that it will make one hundred revolutions or thereabouts per minute, and then simply holding a one-quarter inch twist drill against the end of it. In this way a perfectly central hole may be drilled as far as required. A three-sixteenth inch hole is then drilled through the shaft, and the wick drawn through it, after which the "bight" is drawn out through the first hole by the aid of a hooked wire. The pulley is then put on and the oil cup screwed in place.

Railroad Switch Without a Frog.

THE switch without a frog is operated by a swing-rail, pivoted either at the end or in the middle, or hinged at the end by means of fish-bars as ordinarily used in fastening the ends of railroad rails together. This swing-rail is connected with the switch-stand by a simple mechanical means, in such a manner that when the switch is opened or closed the swing-rail is changed from one track to the other and common to both tracks. The new switch is adjusted to heat and cold. The manufacturers have also an invention to keep the ends of the rails from being battered. The switch is adapted to large yards as well as way stations. It is pronounced by railroad men and first-class mechanics to be far superior to anything yet produced, and is said to be marvelous for its many advantages over the old frogs now in use. The combination in its construction of simplicity, safety, durability and cheapness, is unique in excellence.

The West & Baldwin Patent Railroad Switch Company, Clarksville, Missouri, invite an investigation by railroad men, manufacturers and capitalists, and will send photographs and models for examination to responsible parties.

Their switch is covered by two patents and one more now pending. They are desirous of getting it into use immediately, and in order to do so will give the first railroad that takes hold of it the use of their patents for $1.00 per mile; or, in order to get money to introduce it (provided some road does not accept their offer), will sell the undivided one-third for the best bid within the next ninety days.

Gleason's Rotary Engine.

THE rotary engine invented and patented by Albert H. Gleason, Wabash, Indiana, is composed of casing provided with induction and eduction ports, and having cam grooves formed in the inner faces of its end plates, piston composed of plates and disks provided with radial slots; slides working through between the adjacent ends of plates and in line with slots; and arms arranged between the piston and the end plates of the casing, and having their inner ends fitted to and extended through slots and made fast to one of the slides working through between the adjacent ends of plates, near the inner edge of the latter, and having their opposite ends extended outward in radial line with the other slide thus working, and provided on said outer end with lateral stud or extension operating within the cam groove.

This construction, it is claimed, allows the use of a cam groove of much larger diameter than where the stud operating within it is connected in a horizontal line with the stud, a desirable improvement for the reason that the curves in a cam groove of large diameter are less acute than those of a smaller one, with consequent less friction and easier operation. The Gleason rotary engine is, moreover, said to be light-running and almost noiseless.

NINE hundred miles of railways have been constructed in New Brunswick, and are operated by the following lines: New Brunswick Railroad, operating 443 miles. The Grand Southern, connecting St. John and St. Stephen, and in process of construction along the coast of Maine to Bangor, operating at present eighty miles. The Intercolonial (Government) Railroad, operating 345 miles in the Province, and connecting St. John, Moncton, and the north shore of the Province with points in Nova Scotia and the upper Provinces. Other lines are: The Albert Railway, forty-five and a half miles; St. Martin's and Upham, thirty miles; Elgin Branch, twenty-two miles; Chatham Branch, eight miles; Kent Northern, twenty-eight miles; Dalhousie Branch, six miles.

THE Chicago, Parkersburg and Ohio Railway Company took out its charter April 26; privileged capital stock, $3,000,000, divided into shares of $50 each. The incorporators are: Chas. Smith, Dr. Isaac Scott, A. N. Williams, A. B. Beckwith, W. L. Cole, George Loomis, A. B. White, Chas. F. Scott, G. Gibbons, and S. F. Shaw, all well-known business men of Parkersburg, W. Va. It is the desire of the company to push the line through as quickly as possible, and surveys will be made immediately. This is the Chicago and Norfolk connecting link of the great Black Diamond system, and will prove a bonanza to the states of Virginia and West Virginia. The great Kanawha Valley for 210 miles in length, and a territory twenty miles wide, of valuable coal, timber and iron will be tapped, and a fine agricultural field opened to the market. Robert M. Hughes, of Pittsburg, Pa., has been appointed assistant to the president of the company, of the Black Diamond system, which, when complete, will own 655 miles of track in Ohio, Virginia and West Virginia.

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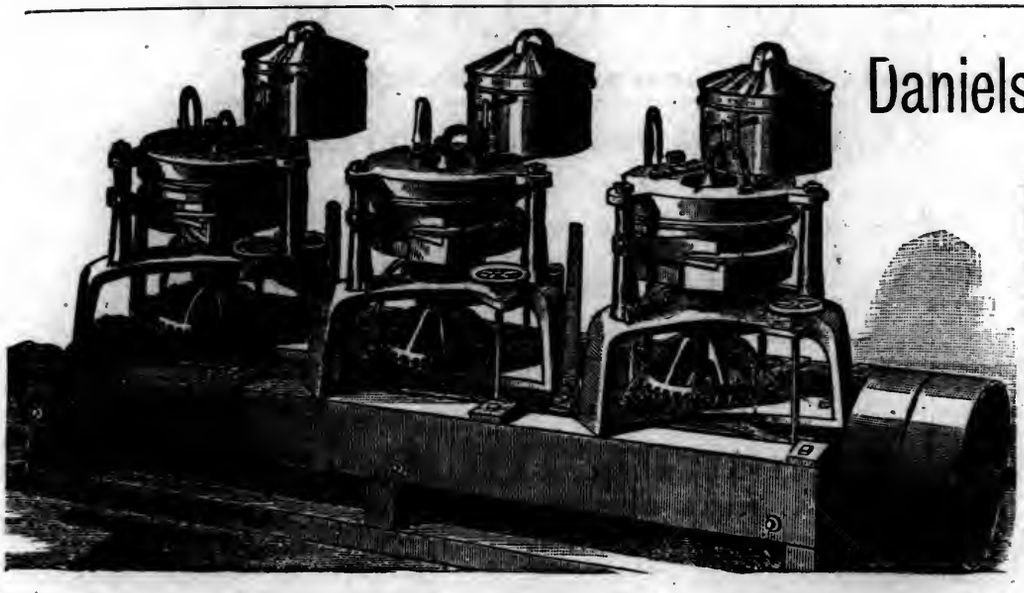
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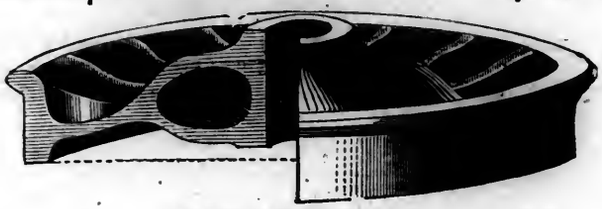
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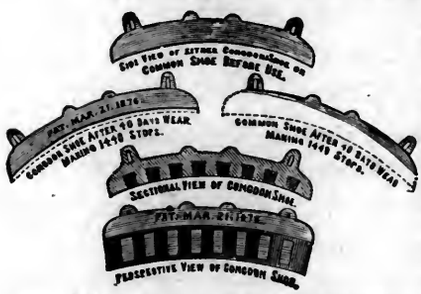
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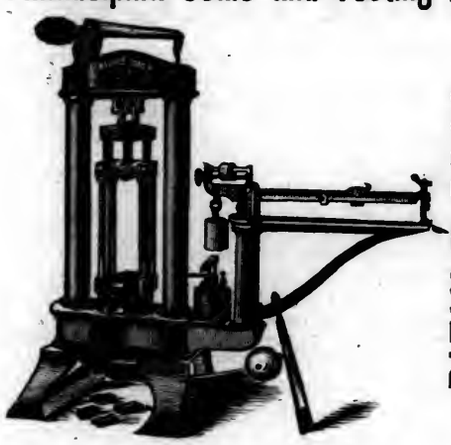
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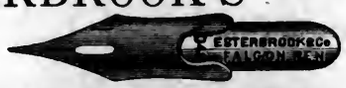
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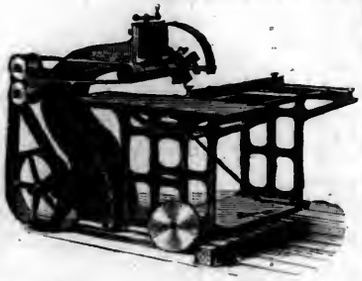
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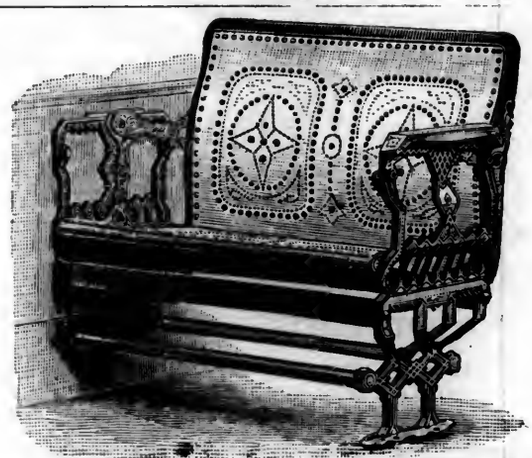


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American Railroad Journal.

WHOLE NO. 2,553.] NEW YORK, JUNE, 1884. [VOLUME LVIII.—No. 3.

RAILWAY PATENTS.

BY GEORGE G. FRELINGHUYSEN.

(Written for the AMERICAN RAILROAD JOURNAL.)

THE number of patents issued for Railway Appliances is so greatly in excess of the number of such appliances adopted by any of the many railways, that it has been a source of wonder to the on-looker as well as of discontent to the inventors and patentees.

An examination of the *Patent Office Gazette* for any week, will show from ten to twenty patents relating to railways and cars. The *Gazette* of June 3d shows fourteen such patents, of which six are for car-couplings. Accepting that as a fair average, we would have over three hundred different car-couplings every year. Of the six varieties published each week, probably not one of them would couple with any other, so that a road that should adopt any of them would have to transfer to other cars at the end of its route.

The brake inventions are the same in effect; each one starts on a new line, to make a new system, and should it be perfected and made most successful, it could not be introduced unless it was so much over and above anything before known or used, as to make it necessary for all the connecting roads to adopt it, even at the expense and confusion of an abandonment of the system then used by them.

The usual cry of the patentees of any railroad appliance is that they are too honest, that they cannot introduce their device without a "divide" with the president or superintendent, which they decline to make, and therefore suffer neglect.

If more of the patents covered improvements on the devices known, in the practical sense of the word "improvement," more of them would attract the attention of an ever appreciative public. In the very matter of couplings, why do men hover and wallow about making alterations, and as they claim, improvements on draw-heads for couplings, and a peculiar style of coupling-pin, and expect to reap a rich reward from the royalties thereon, when the public are free to use the excellent device of Miller, without charge. Miller's coupling is not perfect, and will doubtless be improved upon, but in its plainest and most imperfect form, it is much better than most of the devices for which claim is made in the numerous patents.

The inventors and patentees who are doubtless much disappointed that they are not immediately besieged by the railroad officials for the privilege of placing the devices disclosed in their last patent on all the railroads of the United States, should remember that letters patent are not granted as rewards to the favorites, as used to be the case, but are simply a grant of security for their inventions; and that the value of the patent depends on the value of the invention which the patent covers and the business ability and perseverance of the patentee. The general misunderstanding in this regard, leads many to follow after a shadow which they feel confident will give them fortune when it is once embodied in a patent. That patents have, and doubtless will be the means of securing great riches, is not my purpose to dispute, but I insist that in order to be of any value, they must cover a new and useful device, which is largely needed, or for which a large demand can be created, and must then be managed and pushed with business ability.

Inventions in railway appliances differ from most other inventions, in that it is impossible for the inventor to make any experimental trials of his invention, as few persons have private railways, or influence sufficient to gain permission to make the trial, even at their own expense, which is ordinarily heavy, and beyond the means of the inventor. This leads them to apply for and obtain patents for their inventions before testing them, which latter would, in many cases, have been sufficient to convince them of the impracticability of the devices patented.

The railroad world was not long in taking up the automatic couplings, the air brake, interlocking switches and improved frogs, not to mention the fish joints, heavy steel rails, and stone ballast. The trouble with the railway patents lies more in the poverty of invention shown by the patentees than in any lack of desire on the part of the managements for improvements, or disposition to rob the inventors of the fruit of their labor. An examination of some of the patents shows clearly that the invention is made for the sake of obtaining a patent, instead of the patent being obtained to secure the invention. This is such a prostitution of the Patent Act that there can be little wonder, and less pity that the patentees do not reap rich rewards therefrom. There is plenty of chance left for these inventive beings to reap a rich reward if they will only patent an invention instead of inventing a patent.

The couplings are not perfect; the brakes are not always to be relied on; air brakes will not "let go," quickly enough, and sometimes not at all, until the valve is opened by hand, and hand brakes are too slow, and expose the brakeman in case of accident.

There is no way of taking on coal without stopping. The heating appliances for cars are very imperfect; the ventilating arrangements, especially in cold weather, might be deemed not to exist, so far are they from being perfect. There are plenty of ways of roasting one's feet and having a draft about the head, or freezing the feet and heating the head, but to make a pure, warm, evenly distributed atmosphere in a car is unknown, or at least unpracticed.

The tracks, rail-joints, switches, frogs, ties and ballast; taking on and putting off baggage; storing and selling tickets; accommodating, assorting and directing passengers; receiving, handling and delivering freight in pack-

ages or in bulk, are all subjects capable of improvements, which would appeal to the pocket of the "soulless corporations," and be of advantage to the successful inventor, and a benefit to the public.

There is no use of trying to invent the Westinghouse brake again, nor the old-fashioned coupler, neither can the Miller coupler be revived, nor the Jennings appropriated.

So Messrs. Inventors do stop trying to get up the same things that have been so long known, with a variation too slight to be seen, and turn your thoughts to new fields, and make more than a colorable change, and you will not so often pay out your fees to the Patent Office as the only solace for your trouble and pains.

The numerous railway patents which never see the light of even an experimental use can only have the effect of discouraging those who see them, from trying to make advances in the same branch. Those who have *inventions* may be sure of having them appreciated, notwithstanding the contrary experience of the many patentees.

Remember that a patent only gives an exclusive right. It simply excludes all others from using the thing patented without paying or arranging with the patentee for so doing; and must be without value, unless the thing patented is such that others will elect to use it, and pay the license fee or royalties for the privilege.

CAUSES AND PREVENTION OF RAILWAY ACCIDENTS.

BY WM. S. HUNTINGTON.

(Written for the AMERICAN RAILROAD JOURNAL.)

THE first railways built in this country were seriously troubled with rail-joints. In keeping tracks in good condition the subject was the most difficult to handle. The rails were simply bar iron laid on longitudinal stringers of wood. To keep the ends of the bars in proper position was an utter impossibility. No matter how strongly they were spiked down, they were bound to curl or bend upward from the effect of rolling weight imposed upon them. The constant vibration pulled out the spikes, and soon the bars would assume the form of a section of wagon tire and were called "snake-heads." So long as the ends of the bars did not rise above the center of the wheels, no harm was occasioned except a dissagreeable rattling, but when the "snake-heads" rose above the centers, they would run upward through the bottoms of the cars and impale passengers after the manner of the sportsman who strings pigeons on the ramrod of his gun. In those days the lists of railway accidents were of a different character from the present. Then, a derailment from any cause was not attended with any serious results other than a little shaking up, a little delay, and a few bruises. The thing most to be dreaded was the murderous "snake-head." There was rarely any accident worth recording that did not come from this source, and people read these accounts with horror. It is difficult to conceive of a more terrible sight than the spectacle of several human beings writhing in agony with a bar of iron the size of a heavy wagon tire through their bodies, yet such was not an infrequent occurrence in those days. But with the advent of the T-rail there was an end of this class of calamity, and accidents assumed a different form. With the new rail came greater speed, and derailments and collisions headed the lists of railway disasters.

The first T-rails were laid without chairs. A broad cross-tie was selected for a joint-tie, and as the traffic was light this method was satisfactory for a time, but as heavier rolling stock became necessary, there was trouble at the joints, and chairs were introduced to prevent the end of the rails cutting into the tie, and the lamination and bending of the rails so that they would "set" in this form, —_/—, making every joint a hollow, which was very destructive to rolling stock and disagreeable to passengers. The chair was an improvement in some respects and an injury in others. While it kept the rails in place laterally, and gave more or less vertical support, it assisted the wheels in pounding and brooming the ends of the rails by reason of the greater solidity of the bearing. There was no end to the various styles and patterns of chairs, but none of them protected the ends of the rails from lamination, and after a short term of service several inches of the ends had to be cut off, or the rails taken from the track and carried to some shop where they were repaired by welding a piece of bar iron on the flattened ends and hammering into their original shape. Both methods of repair were expensive, and were the greatest difficulty with which railway companies had to contend. Millions of dollars were expended in this repairing, and hundreds of thousands in litigation over suits for infringing on patented devices for mending rails.

To give even a brief description of the various joint fastenings that have been introduced, would fill a volume of portly dimensions; and it will only be said here that, while some of them have more or less merit (mostly the latter), there are none that are entirely satisfactory. Chairs have been discarded in the main, and fish-bars are employed as a general rule. Some of these are very near the exact thing required, but there is no device yet in use that prevents the ends of the rails from wearing out, while the main part of the rail is capable of much longer service. What is wanted is a joint fixture that will preserve the ends of rails until the entire rail is no longer fit for service. A near approach to a perfect rail-joint is that which is now becoming known as "Gibbon's Boltless Rail-joint." This is the invention of Mr. T. H. Gibbon, an engineer of large experience, who has made the subject of rail-joints a study for many years. The Gibbon joint was illustrated in the JOURNAL of January last, and is becoming well known throughout the country.

Next in importance is a safe and reliable method of coupling freight cars. The danger attending the coupling of cars, the thousands that are killed or injured in the operation, and the seeming indifference of railway officials in the matter, have caused the legislative authorities to move in the direction of compelling railway managers to adopt some of the devices that have been brought out to prevent this class of accidents. It seems a little strange that a progressive people like the Americans should require the spur of the law to compel them to use such safety appliances as may be secured by a reasonable outlay, yet such is the case, and unless the railway community takes more lively interest in the matter than they have manifested heretofore, they will be forced to adopt such appliances as the railway commissioners may direct. It is well known that public officials are not always appointed by reason of their peculiar fitness for the position,

but through favoritism, and a board of incompetent railway commissioners might enforce the adoption of some inferior devices; whereas if railway experts and managers were allowed to select such appliances themselves, they would very likely secure meritorious devices that would be satisfactory. Among more than 3,000 patent couplers there are few, if any, that are satisfactory, and there is no coupling for freight cars equal to the old style of link and pin. The only objection is the danger attending its use. A train once coupled with the link and pin is the best train on earth, but as it is now operated it is a man-killer. The automatic couplers are objectionable on many accounts and it is safe to say that none of them yet named will ever come into universal use. The probability is that some simple and effective device for manipulating the link and pin, by which a coupling may be effected without the necessity of going between the cars, will constitute the coupler of the future. Among all the thousands of devices, patented and unpatented, one of the most simple and effective is the invention of Mr. Wm. S. Thayer of Owego, New York. This invention consists of a rod of round iron about ¾ inch in size and bent so as to form a crank-shaped lifter for the link. The device is readily attached to the end of the car, and so arranged that the operator stands outside and makes the coupling without going between the cars. This is not an automatic coupler, and in fact, is not a coupler at all. It is what the inventor calls an "Assistant Coupler," and is perfectly safe and reliable. It can be applied to any car at a merely nominal expense, as no changes are necessary as is the case with the general run of new devices which require a change of draw-heads at an expense of $40 or $50 dollars per car.

Another cause of many railway fatalities is that of people being caught in frogs and guard-rails and being held fast while run down by cars and locomotives. This class of accident is becoming alarmingly frequent, and railway managers are looking for an effective remedy for the evil. Several patents have been issued for devices intended to prevent such accidents, but a satisfactory foot-guard has not yet made its appearance. Wood blocking or filling has been tried on many roads, but that affords only a partial protection, and is an element of danger to trains and therefore should be discarded. As an instance of the unwise legislation that might result from the reluctance of railway officials to adopt safety appliances, it may be mentioned that two or three years since the legislature of Michigan enacted that every railway in the State should block all dangerous openings in frogs, guard-rails, and switches, with wood coming to within a half inch of the surface of the rail. It is obvious that the man who drew up the specifications of this bill knew nothing about the matter, and although the bill passed both houses, it did not receive the Governor's approval, and if it had it could never have been enforced for reasons that will be apparent to any one at all conversant with the matter. Rubber filling and steel springs have been tried, but were failures, and some roads are now trying a wood filling that is made to fit in the throat of the rail, and is bolted to the neck of the rail with carriage bolts. This plan fills the space under the rail-heads and leaves a V shaped opening in the flangeway, but it leaves a boot-jack opening at the entrance to frogs and guard-rails, and is only a partial protection. It is expensive to apply, as the rails must be drilled for the bolts, and moreover the wood is liable to split, get into the flangeway and cause derailment. It is altogether unsatisfactory. Probably the best protection that has yet been devised for this purpose is a piece of rolled iron cut to proper dimensions and bent into something like the form of an eaves trough with a U section. This fills the space so as to prevent effectually the feet from being caught, and leaves free flange-room. One corner of the end of the trough or "shoe" should be turned down after the manner of some of the standing shirt collars. This turned down corner makes that portion of the trough lower and wider than the other or main body, and fills the space at the bend of the guard-rail in an effective manner. The trough is held in place by spikes driven through the bottom of the U into the ties. In protecting the entrance to frogs, the rolled iron must be cut tapering, so that when it is bent it will be six inches or more in width at the wide end, and two and a half at the other, so as to fill the throat of the frog running toward the point. The iron should be at least No.16 gauge, and the appliance, when properly cut and fitted, affords the best foot-guard yet in use. It is the cheapest, most durable and easiest applied, and more effective than any wood or steel filling. In this connection it will be noticed that illustrations of wood blocking have been widely circulated, showing the filling bolted into the "butts" of frogs *where no wheel flanges ever run*, and where a simple blocking of wood may be spiked in that will fill the space up to the surface of the rails.

The foregoing are some of the most important matters now up for the consideration of officials, as questions both of economy and of humanity. The adoption of such appliances as will reduce the liability to accident to a minimum is, or should be, the prime motive actuating railway managers, and in this field inventors may spend their time and exert their inventive genius with profit.

AMERICAN VERSUS EUROPEAN RAILWAYS.

BY AN OLD TRAVELER.

(Written for the AMERICAN RAILROAD JOURNAL.)

LOOKING over the files of the AMERICAN RAILROAD JOURNAL, I recently stumbled across an editorial in the issue of March 17th of last year in which English and American railway travel was sharply contrasted, to the material advantage of the latter. The animus which prompted the writer, lay in a slighting allusion to the American railway system contained in the latest edition of Chambers's Encyclopædia.

It is the fashion of travelers of all nationalities to exert their patriotism in behalf of home institutions and at the expense of foreign; as an old traveler, I am not free from this universal trait, nor am I at a loss to account for it. The familiarity with home methods, the knowledge of the ways and means obtaining in home institutions are natural incentives to the belief of a superiority that may not exist. In nothing does the claim of superiority appear so often as in the discussion of the relative merits of American and foreign traveling systems, and in nothing does habit more influence judgment. To obtain a fair and unbiased opinion as to the superiority of the one to the other, the searcher for truth must apply to the increasing body of cosmopolites—the old stagers to whom London,

Paris, Berlin, St. Petersburg, Vienna, and New York are but parts of a common whole, and which convey no idea of nationality. To the world's traveler there are no nations. Every typical city is but a section of a boundless town, in the several parts of which the habits and customs of the residents are peculiar and *sui generis*.

While not pretending to have acquired the right to deem myself a member of this apathetic class of nationless individuals, it has been my good or evil fortune to spend much of my time in traveling in Europe and America, and while, as becomes a good American, my predilections are strongly in favor of all that pertains to Columbia, my sober judgment and experience has led me to disarm prejudice in instituting comparisons. In the matter of railway travel, I lay it down as a wholsome truth that America has much to learn and much to teach.

It is necessary at the outset to institute a *fair* comparison. Nothing is easier than for an American to place in juxtaposition a magnificently equipped and leading American line of railway, with a second class line on the continent, and the result of this comparison would be very flattering to his national prejudices. The same would be equally true were an Englishman to contrast a British trunk line with some of our miserable railways in the South. But neither of these comparisons would be just. The leading types must be contrasted in order to form an honest judgment. The railway system of Europe exists in its perfection in Great Britain. France, I think, may fairly rank second in the completeness of its railway travel, while my experience justifies me in calling the Italian railways the poorest in their equipment and conduct of any I have patronized in Europe to an extent permitting me to form an honest and sober opinion. Here in America the finest roads are found in the New England and Middle States; the Western roads rank second, while the Southern railways, from the force of circumstances and the poverty of the surrounding territory, are the poorest in the country. I shall typify the American and European railways by taking on the one hand the leading lines of the Eastern and Atlantic States, and on the other, the main British lines. Each is taken at its ripest and most progressive stage, and a fair comparison may be drawn.

It is well to learn before we teach, and I will therefore endeavor to state those features of English railways that we could adopt in this country with advantage. Incidentally there are details of these features that are inferior to their American correlatives, and there is no sharp line of demarcation separating the two systems, enabling us to say that one entire feature of the one system is superior to the corresponding feature of the other. To a great extent we can only deal in generalities, and even then will be confronted with frequent points of exception.

The English railway—I mean the road itself—is, I think, far superior to the American. The road-bed is better ballasted and receives greater attention than in this country. Single-track roads are almost unknown, and the tracks cross a thoroughfare either above or below it. The chances of accidents are thus much lessened, and there is furthermore so excellent an apportionment in the duties of railway employés, that responsibilities are fixed. The English switch and signal system is a marvelous improvement upon the American. There, all lines are divided into sections, and all the switches upon each section are controlled at one point and are under the supervision of one official. The interlocking switch and signal system as employed upon English railways entirely precludes the possibility of a misplaced signal. It is impossible for trains to be derailed, and nothing but the most criminal negligence on the part of the engineer or driver, as he is called abroad, in failing to read aright the signals, can bring about a collision. Coroners' juries in England do not bring in verdicts exonerating all employés from blame in case of accidents. The class of men employed in responsible positions on English railways—drivers, stokers and guards—are perhaps not as intelligent as their American compeers, but as a class are more reliable and better trained. Track-construction in England is also superior to our own. Each rail is clamped, and a rail may be instantly taken up and another substituted without delaying travel. The clumsy and primitive spike is not used.

The stations along the line of English railways are superior in every way to those in America. Each is tastefully laid out with flower-beds and graveled walks, and you do not meet with the crazy sheds that are so common here. The English call them "stations" entirely, and are somewhat puzzled at the employment of the word "depot" in America. I don't wonder at that. We have no warrant for "depot," and I rejoice to see that the misuse of the word in this connection is disappearing. There is a uniformity about the stations on English railways that is pleasing. They may not have as palatial buildings as some in this country, but the average is certainly better, and there is never a disgraceful exception to their neatness and attractive appearance. I must say, however, that in providing interior accommodations for their patrons, the English railway stations fall behind the American. American travelers have found this out to their cost.

Upon the question of the comparitive speed of railway trains in England and America, much has been said, and on this point of all others, Americans have shown a disposition to yield the palm to their trans-Atlantic brethren. I doubt if the average speed of English trains is superior to that of American. In long distance trains I should say that America even had the advantge in the question of speed, for there are no English trains that maintain as high a speed as the Chicago limited, on the Pennsylvania, or other phenomenal express trains that have recently been put upon our main lines. But the English excel us in the speed of trains running short distances. They have no slow trains, and the speed attained by some of their trains for distances under one hundred miles has never been equaled on this side of the water. Local travel is not subordinated to through travel as in America, and in this respect the English public is treated with greater fairness. For this reason I should rank England ahead of America in the question of speed.

In punctuality and accommodation to the public, the English railways are far in advance of American. Trains are run exactly on time, as a general rule, and there are few vexatious delays experienced by the traveling public. It is perhaps easier to establish a system of punctuality in England than in America, for the territory in the former case is very limited, and there are no trains of over twelve hours' run. It also follows that the connections made between trains are not exposed to the delays which may arise from a multitude of causes when there are thousands of miles traversed without change of cars as in this country. Possibly, also, the better training of English

railway employés may also tend to render punctuality more common in England than in America. At any rate, that the English railways are ahead of ours in the punctuality of their trains, I have no hesitation in affirming.

The train accommodation of English railways is also much superior to that afforded the traveling public in America. The train schedules are drawn up with greater care, and the needs of the towns along the various lines more fairly considered. The English railways do not take advantage of towns in which they have a monopoly of travel, and while I am not familiar with the financial management of their roads, I should say that the English railway managers were less "on the make" than the American, in those cases where they possess a manifest advantage over their patrons.

I have epitomized those features of English railway travel and management which are superior to the corresponding features of American railways. In these respects America may learn some salutary lessons, and imitate the examples set by England with profit. It is not to be supposed, however, that the English railway is entirely superior to the American, for in some respects the latter is infinitely ahead. When the comparative comfort and luxury of rolling stock, to say nothing of comeliness, is called into question, the Americans can score a great advantage. The English railway carriage is immeasurably inferior to the American railroad car, both in comfort and in appearance, and the English engine is the homeliest of objects when compared with that beautiful specimen of workmanship, the American locomotive.

A few years ago, the system of first, second and third-class carriages prevalent in England would have rendered comparison very difficult with those of America, where but one class was employed. It is now, however, possible to divide the American railway cars into three grades, nearly corresponding with the three classes of the English. The Pullman, Wagner, and other parlor cars of American roads may be considered as corresponding with the first-class carriages of England; our ordinary passenger cars with the English second-class carriages, and our emigrant cars with the third-class. In the first two cases the comparison is strongly in favor of the American vehicles. The English first-class carriages are infinitely inferior to the Pullman and Wagner coaches, and are not even, to my way of thinking, up to our ordinary passenger cars—certainly not to those recently put upon the main lines extending westward from New York. The English carriage is a stuffy little box with doors upon the side, into which the passengers are locked like a herd of cattle. Having no aisles in the carriages, it is impossible for the train hands to pass through the train, no matter what the emergency. The tickets are collected while trains are standing at stations, and needlessly prolonged stoppages are thus made. There are no toilet conveniences on their carriages, and travelers frequently suffer the greatest physical discomforts. The ventilation is wretched, and no care is taken to render them conducive to comfort, nor, I must confess, are they subjected to as thorough and frequent cleanings as one might desire. The compartments are so divided that one-half of the passengers must ride backward, and of course the turning of seats is impossible. Mind you, I am speaking of the first-class carriages. The second-class are still worse, and the third-class are unspeakably vile. Sleeping cars were unknown in England until a few years ago, when some Pullman sleepers were put upon the Midland Railway, between London and Edinburgh. They are not viewed with much favor, however, and as the "Danbury *News* man" has aptly stated in his work on England, they are patronized almost exclusively by Americans—probably for the reason given by the same gentleman, that the English have a horror of being rushed into eternity in their night clothes. The English are nevertheless waking up in this matter, and several roads are making a specialty of cars on the American plan.

The system of handling baggage is also much superior in this country, and it is not until very recently that the English adopted any method of checking luggage from one station to another. On many English lines, baggage is not checked at all, and the passengers must take their chances. Trunks are shoved in a baggage or luggage compartment and "identified" by their owner. This may be a very easy way of baggage transportation, but it is open to the serious objection that somebody else might, and often does take a fancy to your paraphernalia and appropriate it unto himself before you know it.

There has also been a great deal said about the politeness of English railway officials, and certainly in that respect they are superior to American railway hands, but the reason is obvious—they expect to be feed, and their expectations are generally realized. In this connection I will say one thing in favor of English railways, and that is that all complaints of travelers are listened to with courtesy and attention, and rudeness and insolence on the part of employés is promptly punished.

Lastly, to consider the comparative rates of travel in England and America. This is a question that bears directly upon the purse, and is naturally not far from the heart—especially of our thrifty people. I can safely say that the rates are much lower in comparison in America than in England. Our rates for first class accommodations, parlor car included, are less than the rates for first class travel in England, and in most cases are no higher than those charged for second class. Our rates for traveling in ordinary passenger cars is about the same as the third class rates in England—possibly a little more, but very little, if any. As to our rates for emigrant travel, it is far below the lowest rates on English railways. These are cold facts, and call for no comment.

So much for passenger travel. In the matter of freight transportation, I should consider the American roads far in advance. The freight rates are much lower in this country, and the means of conveyance much superior. As a rule the English lines do not use box cars for their freight; it is generally put upon a platform car, and in case of bad weather, covered with tarpaulins.

I have endeavored to institute a fair comparison between European and American railway travel, exemplified on the one hand by the English railway system as a perfect type, and the conduct of the main American lines of the East and Northeast on the other. It is difficult to award the palm of superiority. Were I asked to say which roads I have found the more comfortable, I should say the American; which the safer, the European; which the cheaper, the American; which the more reliable, the European. The relative claims are pretty equally balanced, but on the whole I should deem the American railway system the more progressive. It must be borne in mind that America

is vast, compared with any country in Europe, (except Russia, where railways are in their infancy), and its population is increasing at a tremendous rate. It is therefore much more difficult to maintain a perfect system in this country. For that reason I am inclined to pronounce judgment in favor of the American railway, but am very far from thinking our own system immeasurably ahead of the European. Possibly even the slight advantage which I am disposed to award it, arises more from an unavoidable feeling of nationality than from a strict sense of justice, but in that I am not alone. The same may be said of any European who extols the foreign railway system; and in sober truth, there is so much to be said upon both sides that though an observer may signal special features in the two systems that are better or worse as the case may be, the average excellence is about the same, and in general, one is as good as the other. The two systems are approaching uniformity, and in both there are constant improvements.

THE ORNAMENTATION OF LOCOMOTIVES.

BY A MASTER CAR-PAINTER.

(Written for the AMERICAN RAILROAD JOURNAL.)

THERE is far more in the ornamentation of the locomotive than master mechanics or supers ever give heed to. They do not see that where a handsome piece of painting is put into the hands of an engineer, fireman or cleaner, there will be an extra exertion on their part to preserve it. They are blind, also, to the fact that a neatly painted and brassed engine and tender gives tone to their road, or in other words, lifts it out of the category of a one-horse line, entirely unfit for high grade passengers to patronize, where another line running to the same point can offer better appearing conveyances.

The rage some years ago for profuse ornamentation on tenders was seemingly going to extremes to find a medium. Large Roman scrolls, with a portrait or landscape, a monogram, or pictures of birds and beasts in the center-piece require the best talent in their execution, and that of course is expensive; and it is not to be wondered at that stockholders should demur at the lavish cost of painting. There is a limit to such things, and it should not be exceeded; while at the same time there is a point below which the rolling stock should not be allowed to go. A monster locomotive, coated all over with lampblack, with nothing to enliven its funereal appearance, no striping, scrolling, etc., does not appear to be in keeping with the gold bedecked palace coaches which are strung out behind it; and even upon the freight trains the caboose will, in most cases, outdo the engine in its ornamentation and luster.

One may notice with what care the fireman will jump off at a stop, and run over with waste, the bearings and the painted parts, keeping everything in order at all times. And again you may notice with what tenacity the men will cling to their hearse-like cab, never once leaving it except to squirt a little more oil upon working parts, or to give an extra "set up" to a key or nut. And while one machine goes steadily on until the continued wear and tear, and the effects of the atmosphere on the paint and varnish compels rejuvenation, the other rapidly decays for want of care, simply because there is nothing about the engine to be proud of.

The expense attached to a medium amount of striping and ornamenting is nothing compared to the difference in the care taken to preserve the work; and this is a subject which demands more than a passing thought. The oft repeated wiping with oily waste over the varnish, tends to preserve it, for the oil is absorbed by the continually decaying material, and a new life, as it were, is given it. The main dependence, or life of varnish, is oil, no matter whether it be linseed or machine oil; for the close combination of sulphur fumes from the furnace and the de-oxygenized air from the smoke stack is ever preying upon and destroying it, and while one machine is well wiped, the other is seldom gone over. This may be noticed more particularly upon an engine whose sand-box is nicely painted, and the tender plain black; the box will take the eye of the men engaged in wiping off, and receive a goodly share of rubbing, while the tender may possibly be scrubbed off with an old broom; the first always look well, the latter always seeming on the road to decay. Roman scrolling, such as was once put on for ornament, is considered the highest grade of such work, the bold stems and leaves rolling gracefully out as if they could be plucked from the ground on which they rested, the lights and shadows thrown in by a master hand, and the whole *tout ensemble* pleasing to the eye of every educated beholder. But such work is not necessary now upon a locomotive. The taste or fashion is changed, and a simpler arrangement of figures or arabesques—some even so crude that a schoolboy might equal, if not excel them on his slate, have taken the place of what we might term good work. The columns of this JOURNAL frequently teem with illustrations of the kind mentioned, and I will not add thereto.

Striping is an easy means of ornamentation, and an inexpensive one as well. If the painter has good taste in the arrangement of the lines, he may turn out some very nice work. Stenciling of flat scrolls for corners or around the number in the center of the panel may also be resorted to, and by turning to the back numbers of the JOURNAL, full directions will be found for making double stencil plates, by which the ties or bars of one stencil plate are covered by stenciling the second over it, thus taking off all appearance of a stenciled job. The gold size should be mixed quite thick with chrome yellow, so that it will stay where put, then carefully rubbed over the stencil plate, and be gilded before the second plate is used. If bronze is to take the place of leaf, various colored bronzes may be used, and this will require some little judgment on the part of the workman.

Bronze, if of a good quality, will make a durable job, to all appearance as good as gold; but in order to do this the bronze, which is composed of copper and zinc, or in some cases, the sulphuret of tin, must be coated with French shellac varnish to prevent the acid of ordinary copal varnish from bringing out the verdigris of the copper, and causing it to darken. Stencil patterns nicely cut in oiled pasteboard may be purchased from almost any large paint dealer.

To conclude, I wish to impress it upon the mind of those in charge of the work spoken of, that it is a great mistake to overlook the neat and tasteful painting of a machine which has cost a small mint to build, and it will be found far more economical in the end to finish a locomotive so that every one connected with it will feel suf

ficient pride in its appearance, to take especial care in wiping or cleaning it on every part, and in keeping it so.

EDUCATION OF LOCOMOTIVE ENGINEERS.

READ BEFORE THE RECENT CONVENTION OF THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION, BEING THE REPORT OF THE COMMITTEE ON THE "BEST MODE AND MANNER OF EDUCATING YOUNG MEN FOR LOCOMOTIVE ENGINEERS."

CONSIDERING this subject to be of vital importance to the Association and to the public in general, and that proper care and attention have not been given to it in the past, the committee have spared no pains to get all the information they possibly could on this subject, knowing and feeling that men selected to fill the responsible position of locomotive engineers must possess faculties that, as a general thing, do not belong to all the human race; and as locomotive engineers have to be selected from the ranks of firemen, they feel that due care and caution should be exercised in selecting young men for firemen. Now, to arrive at a proper conclusion—one that would be satisfactory to the Association and to the railways of the country, your committee sent circulars to all the Master Mechanics in the United States, Canada and Mexico. We sent out five hundred and thirty-two circulars, to which we received seventy-six replies, being on an average of one answer to every seven sent. Many of these replies contain very valuable information, and were from many of the leading roads of this country, Canada and Mexico. Your committee beg leave to return thanks for the answers to their circular.

The opinions given us by the different Master Mechanics who replied were as follows: Five recommended that none but machinists should be locomotive engineers; nineteen thought nothing more was needed than to have a young man fire from three to four years with good competent engineers to make him a good runner; fifty-two thought that one year in the shop and round-house, with two to three years' firing, was necessary to make a competent engineer; many recommended that young men, while firing, read and study books that would give them a general knowledge of the locomotive, such as "Forney's Catechism of the Locomotive," and several other works of that kind. Many of the replies admitted that machinists would make the best runners if they would consent to fire one year after having learned their trade, as they would then have the advantage of knowing all about the construction of the locomotive. Of course, when speaking of that class of men, they meant bright, intelligent young machinists—men with nerve and energy, and quick to act in cases of emergency. Of course, there are some who would never make engineers, no matter what opportunities were given them. If young men of this kind would consent to run one year or more as firemen, we could select our locomotive engineers from among that class; but they will not do it, from the belief that they are just as competent to run a locomotive as the best engineer on the road for which they are working, and if they are given an opportunity to run an engine they are certain to make a failure.

This being the fact, we are compelled to select our engineers from among the ranks of the firemen, as the best and safest runners. Now, this being the class of men from which we have to select our engineers, some uniform mode of instructing them for the responsible position that many of them will have to fill in the future will have to be adopted by the different railroads in America. Your committee would therefore recommend the following:

All Master Mechanics should have full control of the engineers and firemen in the employ of their respective roads, with full power to hire and discharge the same—of course, recognizing the rights that the General Managers or Superintendents have to order the discharge of any engineer or fireman for neglect of duty.

1st. The qualifications for the position of fireman on all the railways in America should be as follows: The applicant should be from eighteen to twenty-four years old, able-bodied and in good health, with a good common school education and a fair knowledge of arithmetic, and of sober and steady habits. All applicants should be required to make application in their own handwriting, signing it in the presence of the Master Mechanic or the person he may appoint to hire that class of men. In selecting men for firemen, great care should be exercised. The Master Mechanic should endeavor, so far as lies in his power, to select energetic, smart and active young men—men of nerve and presence of mind, quick to act in cases of emergency which may occur in the position they may be selected to fill in the future. If we select men of that kind, there will be very little difficulty in educating them up to the proper standard to fill the place of engineers.

2d. There should be three grades of firemen, classed as Junior, Intermediate and Senior Firemen—the young man just commencing to be classed as Junior Fireman, and so on up to Senior Fireman; the Senior Fireman receiving the highest pay for his services, the others in proportion. When a fireman has fired four years and is worthy of promotion and fully competent to run a locomotive, there may be no vacancies in the engineer force on the road by which he may be employed. In that case we recommend that he receive a small amount more per day than the Senior Fireman (say from fifteen to twenty cents per day more), and be ranked as Veteran Fireman. On the road which one of your committee represents in this Convention this custom has been in vogue for a number of years, and has worked exceedingly well. All the engineers on this road have been educated under this rule, and to-day no engineers in the country rank higher than they do.

Proper care should be taken in selecting young men for firemen as to their ability to distinguish colors in a practicable, common-sense way. We recommend that all railroads having a sufficient number of employés to justify them in so doing, have a reading room and library for their firemen and engineers, in which the other employés could participate. The library, to some extent, should consist of works on the locomotive engine that a man with fair education could understand. While we do not think it essentially necessary, still we believe it would be beneficial to some extent to let firemen work one year out of the four in the shop and round-house, so that they might obtain a more perfect knowledge of all the parts of the locomotive.

Young men consisting of the class we have mentioned are certain to make good runners, and there will be no difficulty, at the proper time, to select good junior engi-

neers from among that class of men. All opportunities possible should be given firemen to get such knowledge of the theory and movements of the different parts of the locomotive as would be beneficial to them when they enter on their career as engineers. To accomplish this end, monthly lectures might be given in the reading room by men of good practical common sense, who fully understand what they are talking about. If possible, these lectures should be given by one of the engineers. The firemen would learn more from him, as they would better understand what he was saying, he having formerly been one of them.

Your committee is convinced that if the mode recommended by them is adopted generally throughout the country that, if not all, a large majority of the firemen would be educated to a point from which there would be no difficulty in selecting men who will make good and reliable engineers.

3d. The fireman now being competent to run a locomotive, and being placed in charge of one, has yet some few things to learn that he did not have the opportunity of learning, from the fact that he was not running the engine. While he may run carefully and avoid accidents, he has to learn to run his engine with economy in the consumption of fuel and the cost of repairs. To learn this and to give the young engineer an opportunity to become a first-class man in his occupation, we recommend there be three grades of engineers—first, second and third grades—and that the remuneration they receive be according to grade; the fireman just promoted ranking in the third grade; after one year's service he enters the second grade; when two years have passed he enters the first grade, and becomes a first-class locomotive engineer.

Your committee is confident that if the different railways in the country will pursue the mode and manner laid down in this report, there will be no further difficulty in selecting good and faithful men to fill the responsible position of engineer.

The General National Exhibition at Budapest, 1885.

IN conformity with a bill submitted to the Hungarian legislature by Count Paul Szechényi, Royal Hungarian Minister of Agriculture, Commerce and Industry, the bill No. XII, of 1883, has been passed for the purpose of instituting a general national exhibition to be held at Budapest, the same having received the sanction of emperor Franz Joseph the First, King of Hungary. By this act the general national exhibition to be held in the year 1885, at Budapest, has not only been placed under the patronage of the Hungarian government, but has been declared a national question, the government being invested with the direction of the undertaking to propose and organize the same. A general commission has been appointed by the above-named minister, and intrusted with the immediate management of the affairs of the exhibition. The general commission is composed of the following members: President, Dr. Alexander Matlekovits, secretary of state; second president, Count Eugen Zichy, president of the National Industrial Society; director, Dr. Julius Schnierer, counsellor of the ministry. It has beeen decided and decreed by the general commission, in consideration of the limited character of the exhibition, it being intended to produce as complete and faithful a picture as possible of the productions and handiworks of Hungary, to organize simultaneously with the general national exhibition, and on the same precincts, a separate international exhibition of motors and working machines, tools and implements for artisans and traders, as well as agricultural machines of the latest and most approved constructions, and all important patented inventions and improvements. It has accordingly been taken into consideration to propose the participation of foreign countries in this special exhibition, and to make arrangements for the exhibition of their superior productions. The special exhibition, as well as the general national exhibition, will be opened at Budapest on the first day of May, 1885, and closed on the fifteenth day of October, 1885.

Further particulars are to be found in Consular Reports for February, 1884, published by the Department of State, Washington.

The Economical Use of Turpentine.

TURPENTINE, though not an expensive material, is valuable, and should not be wasted. How often do we see a man attempting to pour from a five-gallon can, some turpentine to thin up a pot of paint, and instead of a pint going into the paint, a quart is spilled upon the floor. Turpentine is volatile, and a good portion evaporates, and if left standing in an open vessel or one not closely covered, much of it is wasted.

Again, we see it used as freely as water in rinsing out brushes, the "dirty turps" being thrown into the slush barrel; poured upon the hands when washing, slopped over the floor, and in other ways "made little of." The storage of turpentine can not be trusted to wooden barrels, for a slight shrinkage of the wood gives opportunity for leakage of the extremely limpid spirits, so as a general thing empty varnish cans are used to hold it. This is a good plan, but a better way to keep turpentine is to have one of the patent safety oil tanks such as are used by dealers in kerosene oil, having a reservoir and pump to raise the liquid, and a return drain by which all that is spilled in pumping returns to the reservoir again. This arrangement is becoming universal among large carriage builders, and it is said that a very perceptible difference is noticed in turpentine bills. No railroad paint-shop is complete without one of these tanks, and there are many kinds in market, and for sale in every large town, so that no excuse can be made for being without one.

To Keep Railroad Cars Cool.

THE French railroad authorities are at present engaged in a series of experiments from which, perhaps, our own directors might take some hints. With hot weather coming on, or at least in the ordinary course of nature expected, the problem is how to keep the railway carriages cool. In France travelers are packed very tight, and most trains go very slowly, and the authorities have to arrange to deliver their human cargoes at distant termini with vitality not quite extinct. So they are now exercised in seeking how to cool their carriages. They have gone as far as India for suggestions, and the favorite experiment is with a kind of punkah. A long cylinder runs

the length of the roof of the carriage, furnished with fans, set in motion by revolving the cylinder. After many systems tried, this seems to be the most practicable, and the only point in dispute is how to get the motive force. The surplus steam of the engine has been tried on one line, and on another a little arrangement like a windmill attached to each carriage, the motion of the train causing the wings to revolve, while the occupants of each carriage can regulate or arrest the stream of air. Both systems are being tested, and our companies need only take the benefit of these experiments and adopt the most successful or the least costly.

Railway Construction in 1883.

THE annual table issued by the *Railway Age* shows the following total railway construction in the States and Territories of the United States during the year 1883.

N. E. STATES.	ROADS.	MILES.
Maine	6	41.2
New Hampshire		...
Vermont	2	22.0
Massachusetts	4	18.0
Rhode Island		....
Connecticut	1	3.0
EASTERN MIDDLE.		
New York	10	399.2
New Jersey	2	7.5
Pennsylvania	26	363.5
Maryland, and District of Columbia		....
MIDDLE WESTERN.		
Ohio	15	349.0
Indiana	7	180.3
Michigan	16	421.3
Illinois	11	174.7
Wisconsin	10	218.8
PACIFIC BELT.		
California	6	251.0
Nevada		....
Oregon	5	196.3
Arizona	2	156.0
Idaho	2	282.0
Washington Territory	4	161.0
SOUTHERN STATES.		
Virginia	7	98.1
North Carolina	4	52.0
South Carolina	2	40.5
Georgia	6	65.5
Florida	7	245.2
Alabama	4	181.0
Mississippi	5	362.1
Tennessee	4	40.0
Kentucky	6	127.6
MISSOURI BELT.		
Minnesota	8	167.5
Iowa	8	231.4
Arkansas	8	198.5
Louisiana	6	238.1
KANSAS BELT.		
Dakota	11	410.8
Nebraska	9	199.2
Kansas	6	144.0
Indian Territory	2	12.2
Texas	7	68.5
COLORADO BELT.		
Colorado	9	88.8
Montana	4	413.0
New Mexico	3	81.0
Utah	2	160.0
Wyoming		....

RECAPITULATION:

	ROADS.	MILES.
New England States	13	84.2
Eastern Middle States	38	770.2
Western Middle States	59	1,344.1
Southern States	46	1,212.0
Pacific belt	19	1,046.3
Missouri belt	30	835.5
Kansas belt	35	834.5
Colorado belt	11	742.8
Totals	257	6,869.6

Except in 1880, 1881 and 1882, in which years 7,174, 9,784 and 11,591 miles of track were laid respectively, the total new railway mileage in 1883 is in excess of that of any year within the decade. The total railway mileage in the United States, Dec. 31 last, is given at 120,200 miles.

RAILWAY CONVENTIONS.

Master Car-Builders' Association.

FIRST DAY'S PROCEEDINGS.

THE Eighteenth Annual Convention of the Master Car-Builders' Association was called to order by its president, Leander Garey, Esq., of the N. Y. Cen. Railroad, at Congress Hall, Saratoga, on Tuesday, June 10, 1884, at 10.45 A. M. A formal address of welcome to the association was read by the Hon. P. H. Cowen, president of the village of Saratoga, for which the thanks of the association were returned by the president. The roll was called by the secretary, M. N. Forney, Esq. Minutes of last meeting were read and approved.

The opening address of the president, after presenting the list of subjects to be considered by the Convention, took up in detail the question of freight car-couplings, in which he quoted extracts from the Reports of the Railroad Commissioners of the States of Massachusetts and Minnesota, the subject of which was treated at length in an able article in the RAILROAD JOURNAL of last month.

Committees on Correspondence and Nominations were appointed by the Chair.

The report of the secretary briefly outlined the business of the association for the past year, giving as its membership, 133 active, 55 representative, and 4 associate members.

Invitations from the Saratoga, Mt. McGregor and Lake George, and the Boston, Hoosac Tunnel, and Western Railroads to excursions were read, and accepted by the association.

The printed report of the committee on Standard Freight and Passenger Trucks was then presented, and properly referred.

The report of the Executive Committee on Revision of Resolutions Relating to the Recommendation of Standards was next in order. Seven distinct changes were presented in the printed report, which were discussed and adopted with more or less amendments, after which the report was adopted as a whole, taking up matters of detail, for which we have not space, though manifestly of great interest and importance to the members of the association, and the roads they severally represent. At 1 o'clock, P. M., the Convention adjourned for dinner.

At 3.30 P. M., the Convention met to revise their rules governing the condition of and repairs to freight cars for the interchange of traffic, the discussion of which called out many suggestions looking towards the more practical working of these rules and to the settlement of many vexed questions incident to this branch of railway management. The meeting then adjourned until the following day.

SECOND DAY'S PROCEEDINGS.

At 10 o'clock, A. M., the meeting was called to order by the president, and an elaborate paper was read by the secretary, on the Relation of Railroad Wheels and Rails to each other. This paper was in print, and illustrated by numerous engravings. The paper was fully discussed by the members, and finally referred to a committee of five, Mr. Forney, chairman.

The Nominating Committee presented their report, as follows:

For President—Leander Garey, New York City, N. Y. Central and Hudson River Railroad.

Vice-Presidents—William McWood, of Cleveland, O., Grand Trunk Railway; John W. Cloud, of Altoona, Pa., Pennsylvania Railroad; B. K. Verbryck, of Chicago, Ill., Chicago, Rock Island and Pacific Railway.

Secretary—To be elected by the Ex. Com.

Treasurer—John Kirby, of Cleveland, O., Lake Shore and Michigan Southern Railway.

Three Members Ex. Com.—Joseph Townsend, of Bloomington, Ill., Chicago and Alton Railroad; F. D. Adams, of Allston, Mass., Boston and Albany Railroad; and Geo. W. Rhodes, of Aurora, Ill.

The report of Committee on Brake-Shoes, Brake-Beams, and the Interchangeable Parts of the Brake Arrangements, was then presented in print. Committee continued with instructions to report at the next meeting with drawings of a brake-shoe which they would recommend.

The Committee on Standards and Appliances for the safety of train-men, reported verbally through its chairman, Mr. John Kirby, that they had no detailed report to make. Committee continued, and requested to report at next meeting.

The report on Piece Work was read by its chairman, B. K. Verbryck, and accepted.

THIRD DAY'S PROCEEDINGS.

The meeting was called to order by the president, at ten o'clock, A. M. The reading of the minutes was dispensed with by unanimous consent. The report of the Auditing Committee was presented by W. R. Davenport, its chairman, and accepted.

Two committees upon subjects analogous in character, next came up for discussion, viz.: That on House Cars, and that on Framing and Trussing Freight Cars. The latter report was accepted, and the committee continued with instructions to report at the next meeting a form which they can recommend. The question of Freight Car Trucks was recalled for discussion. The general sense of the meeting was adverse to any radical change in the ordinary diamond truck. An informal expression of opinion in relation to the superiority of swinging bolsters over the rigid centers, showed a nearly equal division of the members. The matter was settled, leaving it optional with the builders to use either a rigid or swinging frame. The question of increasing the size of the standard master car-builders' axle in the center, from 3⅞ to 4¼ inches, was referred to a letter-ballot. The committee on Standard Trucks were also instructed to adopt the master car-builders' journal and journal-box.

The report of the committee on Automatic Freight Car Brakes was read by the secretary. Report accepted and committee discharged. In order to test the sense of the meeting, it was moved that none of the freight train brakes as yet brought to the notice of the Association, deriving their power from the compression of the draft-spring, fulfills the requirements of a good train brake. Carried.

A verbal report was made by T. A. Bissell, on Passenger Car Framing and Trussing. The report was accepted and the committee continued, with instructions to report at next meeting, a definite frame for the adoption of the Association.

A communication from the *Railway Gazette* as to a revision of the Dictionary of Railway Terms, was referred to the Executive Committee. Report on Car Roofs was read by its chairman, and the committee continued. Committee on next annual meeting presented its report, naming Baltimore, by D. C. Richardson, chairman, and finally, after some discussion and many votes, Fortress Monroe, Va., was chosen.

Upon reassembling in the afternoon, it was moved that the matter of Car Lettering be submitted to letter-ballot for settlement. Carried.

The committee on Side Dumping and Drop Bottom Coal Cars requested more time, which was granted.

The report of the committee on Automatic Freight Car Couplers was then submitted, and much discussion followed. A committee was finally appointed to make experiments with numerous couplings.

The customary vote of thanks was then extended to those who had aided to render the Convention a success.

The report of the committee on Nominations was then taken from the table for action. Mr. Rhodes having withdrawn his name as a member of the Executive Committee, that of Mr. E. B. Wall, of Columbus, O., was substituted, and upon motion, the Secretary cast the vote of the Association for those whose names had been submitted who were then declared elected.

President Garey returned thanks for his reëlection, and asked if there was any further business before the meeting.

The committee on Subjects for the next meeting asked permission to report to the Executive Committee at some future time, which was granted.

On motion, the meeting adjourned at 6.50 P. M.

American Railway Master Mechanics' Association.

FIRST DAY'S PROCEEDINGS.

THE Seventeenth Annual Convention of the American Railway Master Mechanics' Association was held at the Ocean Hotel, Long Branch, N. J., commencing on Tuesday, June 17, and continuing for three days.

The Convention was called to order by the president, Reuben Welles, of Louisville, Ky., and was opened with a prayer by the Rev. T. F. Brown, of Long Branch, followed by an address of welcome by the Rev. E. Tompkins, of the same place. Forty-nine members answered the roll call at the opening of the session, and some thirty more arrived before the close of the day. An unusually large attendance was present during the progress of the Convention.

The reports of the seeretary and treasurer were then read and accepted.

The secretary stated that many copies of the annual reports of the Association had been purchased by railway companies and managers, showing the wide-spread interest which prevailed regarding the deliberations of the Association.

The reports of the various committees were then handed in for discussion when the convention should determine to proceed to their consideration.

The committee on Entertainment reported that an excursion to Coney Island would be held on the following day, and that the banquet of the Association would be held on the evening of the 18th, at the hotel. Mr. Charles Parry, of the Baldwin Locomotive Works, of Philadelphia, tendered the Association an invitation to

visit Beach Haven on Thursday, the 19th, and remain over night as his guests at the Hotel Baldwin, at that place. The Philadelphia and Reading Railroad, through its general manager, Mr. I. E. Wootten, supplemented this invitation by offering to place a special train to Beach Haven at the disposal of the Association, on Thursday afternoon. The invitations were accepted with thanks.

The next order of business was the consideration of the committee on the subject of Improvement in Boiler Construction. The report was exhaustive, there being many points on which the members of the committee disagreed. The report was discussed at length, and occupied the balance of the first day's session.

SECOND DAY'S PROCEEDINGS.

The second day's session was called to order on Wednesday morning, the president in the chair.

The report of the committee on New Plans of Construction and Improvements in Locomotives, presented their report, which was received.

The committee on Smoke Stacks and Spark Arresters reported that they had had no time to properly investigate so important a subject, and asked that experts be employed to handle the problem.

The committee on Shop Tools and Machinery, submitted a report, which was received.

The report of the committee on the Best Material for Locomotive Truck and Tender Wheels, provoked an interesting discussion on the relative merits of steel tires and chill wheels, which consumed the remainder of Wednesday's session.

In the afternoon the Association and its guests took an excursion in accordance with the programme, and sailed to Coney Island and through New York harbor on one of the boats of the Iron Steamboat Company.

In the evening the annual banquet of the Association was held in the dining room of the Ocean Hotel.

THIRD DAY'S PROCEEDINGS.

The president called the Association to order, and stated that the first business for consideration was the reading of the report of the committee on the Best Practical Method of Educating Engineers. This report, which had been previously printed, was then read and adopted.

The report of the committee on Balanced Slide Valves was then read and received. A discussion followed on the merits of the Allen-Richardson and Morse Valves.

The committee on the Best Method and Material for Lubricating Valves and Cylinders, submitted a report which was received with but little discussion.

The president announced that the reading of papers by associate members was next in order. The secretary then read a paper by Angus Sinclair, of the *American Machinist*, on Fuel Economy with Locomotives, and Mr. F. W. Dean, of Harvard College, an article on the Strain on the Coupling Rods of Passenger Locomotives.

Having completed the regular order of business, the president stated that the Convention was prepared to entertain any motion that might be put before the meeting, and several resolutions regarding the standards adopted by the Association were offered and passed.

The Auditing Committee reported that they had examined the accounts of the Treasurer of the Association, and found them correct, which report was accepted.

The committee on the Selection of Subjects for the next convention, submitted the following report, which was adopted:

1. Improvement in Boiler Construction.
2. New Plans for Construction and Improvements in Locomotives.
3. Improvements in Valve Gear.
4. Steel Castings for Locomotives.
5. Best Metal for Locomotive Bearings.
6. Driving Wheel Brakes: To what Extent is their Use Advisable.
7. Is the Frequent Testing of Boilers by Hydraulic Pressure Advisable?
8. Smoke Stacks and Spark Arresters.
9. Shop Tools and Machinery.

The committee on Resolutions offered a vote of thanks to all those who had contributed to the entertainment of the Association, which was adopted.

The Nominating Committee submitted the following names:

For President—J. H. Flynn, of Atlanta, Ga.; For 1st Vice-President—J. Davis Barnett, of Port Hope, Ont., Canada; For 2d Vice-President—W. Woodcock, of Elizabethport, N. J.; For Treasurer—Geo. Richards, of Boston, Mass.; For Secretary—J. H. Setchel, of Cincinnati, O.; For Mem. Com. on Subjects—T. B. Twombly, of Chicago, Ill.

The report was accepted, and the foregoing gentlemen were elected to their respective offices by ballot.

A vote of thanks was extended to the retiring president for the able manner in which he had conducted the deliberations of the Association, to which he briefly responded, while the newly-elected officers expressed their thanks for the honors conferred upon them.

On motion, the salary of the secretary for the past year was fixed at $800.

The committee on the Place of Meeting for the next Convention, reported in favor of Cincinnati, Niagara Falls, or Montreal.

Several members suggested that, as the Conventions of the Association had for a number of years been held in Northern cities, it would be well to select as the next place of meeting, some point further south; and on motion, Washington was added to the report.

A ballot being taken, Washington received a majority of all the votes cast, and the president declared it to be the next place of meeting of the Association.

On a motion to that effect, the president declared the meeting adjourned to meet on the third Tuesday of June, 1885, in Washington, D. C.

At three o'clock a special train took the members with their families and guests to Beach Haven, where they were entertained at the Hotel Baldwin. The special train returned the following day and landed its passengers in New York city.

CHAUNCEY DEPEW says the sooner a poor doctor, lawyer, or clergyman recognizes that his genius is for merchandise or types, or the skilled trades or accounts, the better for himself, his profession and the world. He has secured positions for two lawyers—one as a brakeman, the other as a freight clerk—and both are advancing with rapid strides and confident aspirations toward the presidency of the road.

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A NEW POLICY.

THE present issue of the AMERICAN RAILROAD JOURNAL appears under a new editor and business manager, the publication office has been removed to 323 Pearl street, the building occupied by our printers, and to quarters in every way superior to the old.

The *personnel* and location of the JOURNAL having been changed, it will also appear to our readers that the general interior form of the publication has also been modified, and a new policy inaugurated. It is our purpose to furnish the railroad world with a style of journalism differing greatly from the numerous publications devoted to its interests. We propose to make the JOURNAL not a newspaper but a monthly railway magazine and review. The daily press furnish more fully than any railroad publication the current railroad news, financial statements and stock quotations. With this branch of intelligence we shall deal as briefly as possible, and devote our energies to the discussion of questions of railway construction and management, and the solution of problems that present themselves to the consideration of railway managers, engineers, mechanics, and others whose interests are concerned therein.

In order more fully to accomplish our designs we have made arrangements for the publication of a series of contributed articles on appropriate subjects from experts and prominent railroad men, the first installment of which appears in the current number. The first pages of the JOURNAL will be devoted to these contributions, of which we hope to have several each month. After these will come such interesting original and selected items as may be written or chosen for their value to our readers. Following pages will be appropriated to the editorial and correspondence departments, and upon the former much attention will be bestowed. The current railway questions of the day will be freely and fairly discussed, and all subjects considered that bear either directly or remotely upon railway interests. Our department of correspondence will be open for the expression of individual opinion upon any subject of contingent interest, and all information desired upon technical and mechanical questions will be cheerfully furnished. The AMERICAN RAILROAD JOURNAL was the first railway publication to recognize the interests of tramways, and our tramway department will receive vigorous attention. Contributions on subjects pertinent to tramway construction and conduct will frequently be published, and especial care given to the absorbing subject of tramway traction. The concluding pages of the JOURNAL will, as heretofore, be devoted to the discussion and explanation of new inventions tending to improve and simplify the present systems employed in the minutiæ of railway management, and the selection will be made solely with regard to their interest and value,

With the announcement of these changes and improvements we ask for the continued and increased support of the railroad world. Not only do we immediately inaugurate our new policy, but we shall endeavor to act up to the belief that no human production can be so good that there is not a superior plane of excellence attainable, and having once begun to climb, we shall endeavor to continue. All we ask is that those who deem such a publication as we propose to furnish desirable, shall give us a fair hearing and decide for or against us on the merits of the case.

A WALL STREET HOMILY.

THE smoke has cleared away from Wall street, and the financial battle which fiercely raged on the memorable 14th day of May is a thing of the past. The corpses have been buried and the wounded given the necessary recuperative attention, and Wall street is the same as ever. A little soberer perhaps, less confiding, less generous, but neither wiser nor more scrupulous.

The oracles and quidnuncs have had full sway, and there has been a powerful exhibition of that peculiar form of sagacity known as hindsight. Probably of the thousand who knew the crash was coming months ago, not ten foretold it at the time, and of course the nine hundred and ninety are greatly to be commended for their reticence and prudence in locking their startling information within their breasts. The numerous theories advanced to account for the upheaval are varied and highly colored, and there is a pleasing diversity about them which enables biased persons to select those exactly in accordance with their inclinations. The bears may lay it to the bulls, and the bulls to the bears; the brokers to the banks, and the banks to the brokers; finance to commerce, and commerce to finance. Even politics is lugged in by the ears, and there are thousands of ardent Republicans who will claim the panic to be an outgrowth of democratic tariff tinkering, and thousands of equally ardent Democrats who will assign as the cause of the panic the maladministration and corruption of the Republican party. It is a case where "you pays your money and takes your choice."

But this time trade and commerce view the convulsion with indifference, and the laugh is upon their side. Unlike the panic of 1873, the present situation is confined to the actors in the scene. Of the forty or more prominent houses that have succumbed within the past few weeks, scarcely one is a strictly commercial concern. The money of the people is no longer in Wall street, nor after recent developments would it seem likely to be for many years to come. The whole panic was a huge game of bluff, in which rascality and audacity finally came to grief.

Brushing aside the visionary and exculpatory theories tending to solve the cause of the panic, the outside world, trade, commerce and the press, seems unanimous upon one point. The panic was a stock gambler's panic. The fictitious values assigned to worthless stocks, the blind confidence imposed in unscrupulous brokers by unsophisticated speculators, and the daring recklessness of parvenu operators, had raised Wall street to fever heat. All that was needed to bring about a catastrophe was a single exposure of fraud and rascality, and it came in the failure of GRANT & WARD. Like a herd of panic-stricken cattle, the speculators crowded each other off the brink of the precipice, in a frantic effort for personal safety.

Last year Wall street was in good humor and ready for any kind of frivolous sport. Upon the appearance of the new five-cent piece a number of mirthful brokers seized the occasion for a burlesque of speculation. The new five-cent pieces were bought and sold and treated as negotiable securities. "Puts" and "calls" were offered, and the street made merry at the expense of the much abused coin. It is stated that one broker who had sold "short," was compelled to suspend with liabilities of $2.75. It was a foolish, harmless jest, scarce worth repetition, did it not serve to illustrate the methods and practices which precipitated the panic, and render a similar occurrence a menacing possibility of the future. There are stocks negotiated to-day which are absolutely worthless. Stocks upon which dividends have never been and never will be paid, yet which are quoted at prices in excess of those of fairly paying securities. They answer the purpose of gambling chips, and that is the beginning and end of their usefulness. There are corporate charters in existence which, for lack of a better adjective, we might denominate "still" charters. The organizations to which they are supposed to give corporate life are purely mythical, nor is their existence even a contemplation of the remote future. The charters were obtained simply for the purpose of issuing stock, as a medium of Wall street gambling. What wonder there are panics when there are hundreds who derive their living from the barter of such trash as the worthless stock of bogus corporations?

The brokers—the legitimate "regular" brokers—despise the bucket-shop and the bucket-shop methods, but are they one whit better because they gamble for thousands while their humble imitators hazard their units? We fail to see it, and even think the burden of guilt is commensurate with the sums involved. It is common sense to presume that a crash of millions is more hurtful than a flurry of hundreds, and the bucket-shops are guiltless at any rate of hypocrisy. They don't pretend to anything better than gambling, and do not cover their practices with any claims to ultra-respectability.

Go on gentlemen! It may amuse you to make fortunes and lose them in the twinkling of an eye. There may be something entertaining in seeing your fellow gamblers ruined, and ere you have recovered your gravity meeting

with ruin at your own door. There is doubtless much high-tone in striving for wealth in a race where dissimulation, selfishness and rascality has the best show, and a high degree of finesse is unquestionably required to ruin your friends and give them your commiseration and sympathy at the same time. This is a great country, and ideas of morality have been somewhat modified since the days of the pilgrim fathers—they were old fogies, and modern progress only laughs at their stiff-backed honesty. No doubt you are right, and yours are the correct principles of business and individual honor. But with all deference we will let you play your own game. If we should take a hand the sport might be spoiled by the introduction of some bungling old-fashioned honesty that would complicate and upset your calculations. No, thank you. We will watch the game this time from a disinterested standpoint. We got one experience eleven years ago, and it wasn't the first, either, but it will be the last. We don't understand your methods nor you ours, so we had better not travel the same road. Good luck to you, and the devil take the hindmost.

If we are not mistaken the voice of the people is very much to the above effect. They don't want that kind of fun. If they want to gamble they can do so without seeking the purlieus of Wall street, and there are greater chances in their favor around a faro table or in a game of draw poker. As to the uses of Wall street, they are chiefly imaginative quantities. To say that the strength of the nation is in Wall street is equivalent to saying that the talent and genius of the country is possessed by the SULLIVANS and FITZGERALDS, and other heroes of the ring and track. It is said that the bulls and bears contemplate a change of locality. We would suggest as appropriate headquarters either the North pole, or an island in the middle of the Pacific ocean—the farther off the better. And gentlemen, pray don't hesitate because you think the country would suffer. In that you are mistaken. It won't suffer a bit.

WANTED ELSEWHERE.

THE railroad world has been favored with two representative conventions during the past month; those of the Master Car-Builders and the Railway Master Mechanics. It would be difficult to find any public gatherings of men that could so well illustrate the development of American intelligence as the two conventions in question. The solid worth and character of the members of the two associations speak volumes for the innate resources of strength in the American mechanic, of which they are the perfect type; and after attending their meetings we fain give a sigh of regret that this element of national strength is not present in other deliberative bodies. Would that our State and National Legislatures could recruit its members from such ranks as these, and in place of the pot-house politician and shallow demagogue, call to their council halls these veterans of skilled labor who by sheer force of character and intelligence have risen from the ranks to positions commanding the respect and deference of capital. And it is not with such men that capital is arrayed against labor. Loyal to those whom they have outstripped in the race where worth is the victor, they are quick to recognize the truth that the interests of capital and labor are identical; that labor is the employer of capital as truly as capital is the employer of labor. Guided by the deliberations and advice of such men, the American workingman would be a factor in the nation beyond his fondest hopes.

RAILWAY SPEED.

PROBABLY no man achieved greater success in the face of well-nigh insurmountable obstacles than did the "father of railways," GEORGE STEPHENSON. Opposed by the powerful toll-road companies of England who possessed a monopoly of travel, by the people themselves, who through ignorance dreaded the imaginary dangers attendant upon the introduction of railways, and even by the British Parliament which solemnly chartered the first railway with the proviso that it should carry no passengers, STEPHENSON persevered and lived to see the mail-coach rotting in the stable-yards, while the iron bands of a score of lines spread out in all directions. But he was not flushed with success, nor is it likely that any man will ever see further ahead and view the possibilities of the future with a clearer mind or calmer deliberation than he. When the little "Rocket," the first locomotive regularly run upon a railway, accomplished a speed of thirty-five miles an hour, there were thousands, who but a few months before had deemed railway travel the dream of an enthusiast, quick to prophesy an ultimate speed of one hundred, and even one hundred and fifty miles per hour. Not so with STEPHENSON. He studied the subject and claimed that the maximum speed which could ever be obtained upon any level stretch of railway would very little exceed sixty miles per hour, and his prophecy has so far been fulfilled. Sixty miles per hour is to-day regarded as extraordinary speed, and the few trains that exceed this figure are almost historical. As STEPHENSON was right in his premises, there is reason to presume that he will be proved correct in his conclusions, but great as were his talents, there is much that was unknown to him, and in fact to the world in his time. It is evident that his calculations of the maximum attainable speed was based upon the supposition that steam would be the motive power in the future as well as in his own time, and the crude knowledge then extant of the enormous hidden powers of electricity prevented his considering that mo-

tive power as applied to railway locomotion. That there is a limit to the achievements of steam as a motive power, is to us most evident. That the maximum speed of railway trains has almost been reached with steam the power employed, seems probable, in view of the fact that while every other branch of mechanical learning has developed new and valuable inventions and modifications, steam power has been practically at a stand-still. In that respect we are no better off than we were twenty years ago. While there has been an improvement in steam methods, steam can do no more now than it could then. Electricity has in the past ten years given us the electric light, the telephone, the duplex system of telegraphy, electric storage, and a dozen other inventions. But in that time steam has practically made no advancement. Even in its own field as a motive power it has been met with rivalry from heat, gas and electricity.

For that reason we are inclined to believe that GEORGE STEPHENSON was a true prophet when he placed the maximum of railway speed with steam as a motive power at a little over sixty miles per hour. It is to electricity that we must look for the great achievements in the increase of railway speed, and there is consolation in reflecting that the era of steam is approaching its conclusion, while that of electricity has but just dawned. If in its infancy electricity can so astound the world with its marvelous achievements, it has a future beyond the wildest dreams of the most enthusiastic electrician. The present generation will lose much by dying so early, but even in the few remaining years left us we must prepare to be astounded by the results of research in the fields of electricity.

EDITORIAL NOTES.

THE numerous army of car-coupling inventors will be cheered at the news from Massachusetts. The Legislature of that State has enacted that all railways under its jurisdiction shall, after the first day of March, 1885, employ automatic safety couplers upon their cars, and the enforcement of this law is placed in the hands of the Railroad Commissioners. The board is to meet in Boston on the 25th of September next, to examine and test the various appliances that may be submitted, and notice has been served upon the inventors of car-coupling appliances to submit models of their inventions on that date. The context of the law and the official notice of the Railroad Commissioners appear upon another page, and we presume all desired information can be obtained from the Commissioners themselves. In the meantime we shall watch the development of the law with much interest, for if successful in Massachusetts, it will undoubtedly be adopted in other states.

ALL fears of a submarine invasion of England have been dissipated at least for the present, since the channel tunnel project was rejected by an overwhelming vote in the House of Commons. It scarcely seems possible that the idea was abandoned through the absurd proposition that France might utilize the tunnel for invasion by her troops in event of war, yet it is amazing to note the serious attention which this suggestion received. Whatever the cause of abandonment, it is extremely doubtful if the project will ever be revived.

* * *

THE active rivalry between the great trunk lines has resulted in greatly increased comfort to the traveling public. Notably is this the case in the superior rolling stock and means of restauration. The new passenger cars of many lines are marvels of luxury and good taste, and in some instances the running of Pullmans upon the trains seems a work of supererogation. Some of the Western express trains are microcosms, and there is scarcely a need that the traveler cannot have supplied without leaving the cars. The painting and decoration of cars has greatly improved by being diminished, and the roads have been quick to grasp the æsthetic principle that natural woods are more decorative than the most elaborate fresco, to say nothing of their durability.

* * *

SPEAKING of new principles of decoration causes us to reflect how quickly an example is followed. The Pennsylvania Railroad was the first to paint its ferry boats the same color as its cars, and the other lines are rapidly following in its wake. The harbor will soon present the appearance of a kaleidoscope, and the boats of the various lines will be recognized as soon as sighted. The New Jersey Central, or its successor, the Philadelphia and Reading, is to be commended for one admirable change in style. There are now upon the boats of this line no "ladies'" or "gents'" cabins. The cabins bear the simple inscriptions, "men" and "women." We believe the waiting-rooms and entrances of the Brooklyn Bridge were the first places in which was adopted the simplest form of sex distinction, and we rejoice that the seed then sown has born such early fruit. The indiscriminate use of the word "lady" is most offensive to all good taste and propriety, and has ceased to convey the slightest signification otherwise than a designation of sex. It might be thrown out of the language altogether with benefit, and in its proper place be substituted the old-fashioned but simple and suggestive appellation of "gentlewoman." The French, who lead us in such matters, have entirely dropped the French equivalent of "lady," and we are glad to hear it. The word "gentleman" as applied nowadays to every individual of the masculine gender is equally distasteful, but—heaven spare us!—what is to be said of "gent," the

vilest and most corrupt and demoralizing abbreviation that has ever crept into our mother tongue, with possibly one exception. The word and the exception are superbly aphorized by the New York *Sun* when it said that "'gents' wore 'pants.'" It is high time people learnt that sex is no cause for shame, and if there are better words to express the sex of individuals than man and woman, we have yet to know them.

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THE West Shore Road has finally passed into the hands of a receiver, and the financial standing of the Philadelphia and Reading is not as favorable as might be desired. For some reason or other railways tumble into insolvency without materially damaging their prosperity. A broker remarked in our hearing, a few days since, that there were some things about his business that he didn't understand. "It is a mystery to me," he said, "how a road can be declared bankrupt, and this declaration be immediately followed by a rise in its stock." There are, truly, a few surprising contradictions in this world, and the above is not the least remarkable.

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THE political caldron has commenced to boil, and in the course of a month or two it will be at seething point; and we feel it our duty, at this juncture, to breathe a few words of warning to the Democratic party whose national convention is to be held next month. At present the indications point to the nomination, by that body, of our worthy Governor, GROVER CLEVELAND, and right here the Democratic party may rush blindly into a fatal error. The Constitution of our country expressly provides that the president shall be a native of the United States, and the great bulk of Democracy do not seem to be aware of the fact that Governor CLEVELAND is credibly stated to be a native of New Jersey.

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THE transfer of the AMERICAN RAILROAD JOURNAL to its present management has entailed a delay in the publication of the present number, for which we trust the superior nature of its contents will make ample amends. The continuation of the Retrospect of Railways in America has been omitted from our columns this month on account of the pressure made upon them by other matter.

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AMONG the many persons who write to the editor or business manager of the JOURNAL, there are a few who omit what they should give, as well for their own convenience as for ours—namely, their full address. To do this would save a good deal of needless trouble for all concerned.

Chicago, Parkersburgh and Norfolk Railway Company.

THE BLACK DIAMOND SYSTEM IN WEST VIRGINIA.

[SPECIAL CORRESPONDENCE OF THE AMERICAN RAILROAD JOURNAL.]

PARKERSBURGH, W. VA., May 31st, 1884.

THE organization of the Chicago, Parkersburgh and Norfolk Railway Company took place at Hall's Hotel. The meeting was called to order promptly at 9 o'clock by Dr. Scott, and upon motion he was nominated temporary chairman, R. M. Hughes, temporary secretary. A recess was then taken until two (2) P. M.; at that hour the meeting was again called, and after the stock matter and by-laws had been attended to, the election of the directors followed. The following directors were elected: Albert E. Boone, W. W. Lucas, W. M. Morse, F. O. Walker, Dr. Isaac Scott, Hon. Geo. Loomis, A. N. Williams, Sidney F. Shaw, C. B. Smith, Gordon B. Gibbons, A. B. Beckwith, City; and D. B. Casto, of Elizabeth, Wirt Co. No other business, the stockholders adjourned, and the directors met immediately thereafter, with Sidney F. Shaw, as chairman. The directors then elected the following officers: President and general manager, Albert E. Boone; vice-president, Dr. Isaac Scott; auditor, A. N. Williams; treasurer, Hon. Geo. Loomis; attorney, W. L. Cole; chief engineer, Col. Jno. B. Yates. Capt. Sidney F. Shaw was then appointed chief of right of way, and the meeting then adjourned, subject to the call of the president.

The survey commenced on June 2d, and the line is ready to be let for contract as soon as possible.

RAILROADER.

High Speed Locomotives.

DISCUSSING the practicability of constructing a locomotive that will be capable of maintaining a speed of sixty miles an hour, the London *Engineer* says: "There are three different ways in which sufficient boiler power—say 1,500 horses—can be obtained on a narrow-gauge—4′ 8½″—road. The first consists in so constructing the engine that the fire-box shall be nearly the full width of the machine. The second consists in altering the construction of the grade. The third in adopting mineral oil as a fuel, either in conjunction with coal or by itself. We put the wide fire-box scheme first, because experience acquired in the United States seems to indicate that the plan is perfectly feasible. Mr. Wootten has run his engines successfully at seventy-five miles an hour. Their driving wheels are only five feet eight inches in diameter, and their grates are nine feet long by eight feet wide. The fire-box spreads far over trailing wheels on each side, and the center of gravity of the machine is very high, but this elevation of the center of gravity promotes steadiness and gets rid of the bumping, jerking motion of engines with low boilers and wheels. The true difficulty about the Wootten engine appears to be the excessive speed at which the reciprocating parts must move. A five-foot eight-inch wheel, running at seventy-five miles an hour, makes nearly 366 revolutions per minute. With a piston stroke of two feet this means 1,464 feet of piston speed per minute. There is no objection to this high velocity; but there is a great deal to the fact that the piston, with all its appendages, as the cross-head, connecting-rod,

etc., should have to be stopped and started 732 times in a minute. Even higher velocities of rotation are obtained by screw engines in torpedo boats, but difficulties are got over with them by making all the moving parts very light. Unfortunately the same thing cannot be done with locomotives. Mr. Wootten, however, manages to get his engines over the road at seventy-five miles an hour without accidents, and if he does this there is no reason why we should not be able to do the same with small wheels."

Fast Time on the Baltimore and Ohio.

A DISPATCH from Washington, June 8, says: "The special newspaper train over the Baltimore and Ohio road, conveying the Washington correspondents from the convention, left Chicago at 2.10 P. M. Saturday (or 3.10 Eastern time) and arrived here at 2 o'clock this afternoon, making the run of 813 miles in twenty-three hours, while the actual running time was but nineteen hours and thirty minutes. The time of the special from Chicago to Chicago Junction—273 miles—was six hours and thirty minutes; actual running time five hours and thirty-five minutes, an average rate of upward of fifty-two miles an hour, an unprecedented run for the distance. At one time fifty-seven miles were accomplished in fifty-nine minutes, and frequently single miles in from fifty-six to fifty-eight seconds. The final twenty-seven miles from Barnesville to the Ohio River was made in twenty-eight minutes, and six miles of the distance was run in four minutes, or at the rate of ninety miles an hour. The 463 miles from Chicago to the Ohio was run in eleven hours and twenty minutes, including thirty-eight stops. Actual running time, nine hours and twenty minutes, or the unparalleled average for the distance of fully fifty miles per hour. From the river to Washington the run was an excellent one, but no special effort was made other than to bring the entire run within twenty-three hours until Washington Junction was reached, when the engineer was instructed to run in the last forty-four miles at the rate of a mile a minute. He exceeded the limit by half a minute, and ran the last sixteen and three-quarter miles in fourteen minutes, the forty-four miles in forty-three minutes and thirty seconds. Notwithstanding the high rate of speed attained, the convention-weary correspondents enjoyed a most comfortable night's rest, and there is no doubt that the actual running time could have been reduced to eighteen hours between Chicago and Washington. The correspondents adopted a series of resolutions thanking Major Pangborn for the luxurious train, and Charles Selden, of the telegraph company, and Conductor Duvall, for courtesies."

Railroads in Venezuela.

THE first railroad built and operated in Venezuela began at Puerto Cabello and led to the westward. About ten miles were built and operated, but embarrassment followed, and nothing is now to be seen except a dim outline of the roadbed. About the year 1870 an English company built a two-foot gauge road from Tucacas to the mines of Aroa, a distance of fifty-five and one-half miles. Poisonous reptiles, wild animals, malaria and dense jungles combined to obstruct the building of the road. The largest bridge has a span of ninety feet. The ties, bridges, and even the telegraph poles are of iron. The road for its last five miles has a grade of 600 feet, requiring specially constructed engines. The freight carry from five to six tons, and the passenger cars about thirty passengers. A road from La Guyra to Caracas, a distance of twenty-two miles, has been in process of construction for several years. The track of the road is three and one-half foot gauge. It is built on a series of reverse curves having a radius of 140 feet. Surveys have been made for other lines, and a small amount of grading has been done on a road forty miles long from Puerto Cabello to Valencia.

An Excellent Plan.

THE Superintendents of some of the leading railroads in Canada having agreed to coöperate with the Meteorological Department at Toronto, a system of weather train-signals has been arranged which, if found to work advantageously, may hereafter be extended. The signals consist of disks arranged to display a sun, moon, or star. The sun is to indicate fine weather, the moon to indicate local showers, and the star wet. They will be carried on the morning trains leaving railroad centers, so that all those who see the morning express-trains will have the forecast. This service is intended for the benefit of the farming community.

THE Greencastle and Southern Railroad Company, with a capital stock of $5,000,000, has been incorporated. Its charter gives it the right to construct railway lines in Putnam, Clay, Owen, Greene, Sullivan, Knox, Daviess, Martin, Dubois, Warwick, Spencer and Perry counties, Indiana, including a line from Greencastle to Vincennes and also to the Ohio River, a total estimated length of 200 miles. Wm. H. Durham, Volney Irwin, Wm. Ermentrout, Gilbert H. Brown, Wm. Daggy, Henry Jordan and John H. Piercy are the directors for the first year, with Durham as president, Ermentrout, vice-president, and Brown, secretary and treasurer.

THE dispute between the Pennsylvania and Philadelphia and Reading Roads with regard to their joint lease of the New York and Long Branch Railroad has finally been settled without the intervention of the courts. The two companies are to run trains over the Long Branch road independently of each other, and are each to guarantee the leased road a yearly payment of $206,000.

SUBSCRIPTIONS for more than seventeen times the desired sum are offered in response to a call of the Russian Government for a loan of £15,000,000 to be used in the construction of railroads. The *Journal de St. Petersburg* says this brilliant result is an evidence of the immense recovery of Russian credit.

STEEL rails eighty-six and one-half feet long have been tried on German railway bridges with excellent results. The noise occasioned by the vibration of rail joints had previously been almost unendurable, but was greatly lessened by the adoption of these long rails.

THE Oregon Railway and Navigation Company has about 1,500 men employed on the construction of its road, which is to connect with the Oregon Short Line. It is expected that the two roads will be united early in the fall.

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

CROSS-TOWN TRAMWAYS IN NEW YORK CITY.

TO the cross-town tramways in this city, the introduction of the elevated roads has been a positive benefit. While to a greater or less extent nearly all of the longitudinal surface roads of New York, if such a phrase adequately expresses those roads traversing the city north and south after the manner of a meridian, have suffered a diminution of travel since the elevated structures were brought into direct opposition with their superior speed facilities, the short lines across the town from ferry to ferry have been favored with an increase of passenger traffic. The reason for this increase is obvious. Not only do these roads sustain their former traffic, but also secure the patronage of the travelers on the elevated roads whose destinations are either a North or East River ferry or points remote from the avenues of the lines. For this reason the cross-town lines, no matter what their starting point or destination, generally have selected those streets to pass through, which will enable them to cross the elevated roads at points where the latter have stations.

There are about a dozen of these cross-town tramways now running in this city, and almost without exception they yield a handsome profit to their owners. Being limited in length they are able to run their cars at short intervals, while the expense of track construction and supervision is necessarily much less than that of the longer up-town roads. If we are not mistaken, there will be a steady increase in the number of cross-town roads in New York City, for the simple reason that they have no rivalry to dread from the elevated roads which experience a reciprocal benefit in that they are enabled to improve their facilities for carrying passengers. It is of great benefit to the elevated roads that while they are of necessity limited in their stoppages, they may connect with surface lines that extend to and from all points and furnish passengers the means of crossing the town. In its greatest extent from east to west, New York City is but two and one-half miles broad; its greatest breadth being about on the line of Fourteenth street, and it is doubtful if an elevated road will ever be constructed for so short a distance. Certainly it could not adapt itself so thoroughly to the tide of travel as a cross-town tramway. From this extreme breadth of two and one-half miles, New York tapers in both directions, and the possibilities of an elevated road through more northern or southern cross-streets than Fourteenth street is still further lessened. Practically the cross-town roads have a perpetual monopoly, and the very causes that operate unfavorably upon the longitudinal roads inure to their benefit.

In view of this fact, it is a little singular that so vast a portion of the city has been neglected by the cross-town tramways. No road crosses Broadway at a point lower than Walker street, and all the territory lying east of the thoroughfare below that point has no connection with the corresponding western section. From the present quarters of the JOURNAL to any point on the North River is a distance of nearly a mile, and as yet there is no means of traversing the distance save the locomotion furnished by nature. Some years ago there was a line of stages projected, but the plan was never put into operation, and the North and East Rivers for a distance of nearly two miles on either shore are unconnected by either stage or tram-car. The Belt Line offers a method to perform this journey to those who set no value upon time, and are content to travel three miles of road to accomplish one of distance, but this line can hardly be deemed a cross-town road, nor does its mission fulfil the requirements of inter-travel between the before-mentioned sections of the city.

It is probable that the establishment of the "annex ferries" between Brooklyn and the railway termini at Hoboken, Pavonia, Jersey City and Communipaw, has in a great measure discouraged the construction of cross-town tramways between the lower North and East River ferries, but it is doubtful if the annex boats could obtain the bulk of travel between the Jersey shore and Brooklyn if a rapid and convenient cross-town line was put in operation. More especially is this to be doubted since the opening of the Brooklyn Bridge. A line of cross-town cars between the North River ferries and the Bridge, would offer greater inducements to the public to accomplish the journey from Jersey to Brooklyn than the annex boats could possibly furnish. It must also be borne in mind that the cross-town travel in the lower portion of the city is by no means confined to those persons journeying between Brooklyn and the Jersey shore. Probably this class of travelers is in the minority. Many business men have constant occasion to journey from river to river, and are now compelled to perform the task on foot. In addition, there are hundreds desirous of reaching the wharves and business houses on the East River from points in Jersey, and other hundreds in Brooklyn having frequent occasion to reach corresponding points on the North River. The annex ferries get none of this travel, and the field is open to the first stage-line or tramway that will provide the means of accomplishing these journeys without the fatigue of walking, or the necessity of submitting to the extortionate demands of hackmen.

The chief difficulty in the way of the successful operation of a cross-town tramway in lower New York City is the problem of crossing Broadway. The travel in this thoroughfare is so great that a line of cars crossing it at any of the streets between Wall and Canal streets would seriously impede traffic, and in turn be seriously impeded thereby. It is doubtful if a charter could be obtained for such a road, especially were it designed to cross Broadway at streets near the City Hall.

This is a serious objection, but not insurmountable. There is no reason why the line could not cross the main artery of city travel either by means of a bridge or a tunnel. Possibly the tunnel might interfere with the contemplated Broadway tunnel, but this latter project is so laggard that we are inclined to doubt its ultimate consummation. The crossing of Broadway on a bridge is a more difficult undertaking, and we incline to the tunnel. New York City may be likened to a huge leviathan reposing on the waters of the harbor. Broadway may then be said to define the spine of the animal, and from it the rib-like streets decline toward the water on either side. Striking in a block midway between Church street on the west side, and William street on the east, a line of tramcars could easily cross Broadway in a tunnel, with very slight deviation and deflection. Such a road would necessarily be expensive in construction but not in maintenance, and its patronage by the traveling public would be very great. Certainly there is need for a cross-town tramway in lower New York City, and if such a road cannot cross Broadway on a level, it must do so either by means of a bridge or a tunnel. A tunnel appears to us the more feasible, and the idea is certainly deserving of consideration by tramway managers.

CABLE RAILROADS.

BY W. W. HANSCOM, M. E.

(Written for the AMERICAN RAILROAD JOURNAL.)

THE system of propulsion of street cars by a cable traveling in an underground slotted tube, having been in operation in San Francisco nearly eleven years, and within the past two years having been put into use in Chicago and Philadelphia, it has brought the subject into prominence, especially as the question of its adaptability has been discussed with reference to its employment in the Eastern cities and towns. The use so far having been principally confined to San Francisco and Chicago, it seemed that some information concerning its more important features, as developed by the experience of the cable roads in San Francisco, would be appreciated by the readers of the JOURNAL. In view of this, it is proposed to give some details of the construction of some of the cable roads in the before-mentioned city, with some of the conditions under which they are operated.

The first cable road constructed in San Francisco was up Clay street Hill, which was considered to be the best adapted to the experiment. This street, from its location and grade, was more free from traffic by teams than many other streets, and the population along its vicinity gave some assurance of patronage, as it was a steep hill to climb, thereby encouraging the residents to patronize a railway which would safely, promptly and rapidly take them to their homes. There being only light vehicles passing over most of the route, the substructure or tube and railway could be made much lighter than if placed on streets frequented by heavy trucks. The question of cost was also an important consideration, as a large part of the capital necessary for the construction of the road was subscribed by people who lived or owned property along the proposed line, and some by the friends of the projectors who were willing to risk some money in the scheme.

The tube for this road was constructed mostly of wood, cast iron only being used in the construction of ribs or skeletons, called yokes or frames, which were made in the shape or form of the tube, with recesses, into which were placed the planks forming the bottom, sides and top of the tube. The part which formed the slot or opening into the top of the tube was made of wood scantling laid along on the cast iron frames and fastened to them. Strap iron was laid along on the top of these scantlings so that the edges of the iron would project slightly over the slot at the sides and prevent the abrasion of the wood by the shank of the grip when passing. Wood being the cheapest material, it was freely used in order that the greatest economy might be exercised in construction; for until it was started and fairly in operation carrying passengers, many even among those who had subscribed the necessary funds were doubtful about its success. But when it had been in operation for a few weeks, doubt was dispelled, and the enterprise passed from an experiment into the domain of an assured practical success. About five years after the road commenced operations, it was decided to extend it, adding about one-third or three-fifths of a mile to its original length. Changes were made in the driving machinery, in the engines, and in the manner of conducting the cable from the street to the engine house, and back again to the street.

The speed of the cable at this time was about three and three-quarter miles per hour, which was increased to about four miles until the extension of the road was made in 1878, when the speed was further increased to six miles per hour, at which it remains.

The cars are light, weighing about 2,800 pounds each, and the dummy the same. The cars seat fourteen persons and the dummies seat sixteen. The gauge of the track is three feet six inches. The cable used is three inches in circumference, and is composed of six strands of nineteen wires each; the six strands surrounding a core or heart of hemp. The wires are of crucible steel .062 of an inch in diameter, and are tested to a breaking strain of 160,000 pounds per square inch of sectional area, and must possess sufficient toughness to be bent a complete circle around a wire of its own diameter, unbent, and bent round again, and again unbent without breaking. The cable is made in one piece, so that only one splice is made in the rope, the length required for the splice being 100 feet. The length of the cable now in use is about 11,000 feet.

When the road was extended in 1878, the tube was made of iron and concrete, wood only being used for covering.

Cast iron frames were made of sufficient height and width to reach from the surface of the street to some eight or nine inches below the bottom of the tube, and to reach from rail to rail, chairs being formed in the castings into which the flange of the rail sits, and is held in place by bolts going down beside the flange and through the chair. Suitable projections were formed at the center of the top of the frame for supporting the channel irons which form the slot. These castings are placed along the road about three feet apart, in a suitable trench, and the rails and channel irons which form the slot are fastened to them, after which the castings are leveled and straightened, and wood skeletons are laid from one casting to another, which are of the shape of the bottom and sides of the tube. Concrete is then filled around them to the thickness of six or eight inches, and when set sufficiently, the skeleton is removed to another place and the operation repeated.

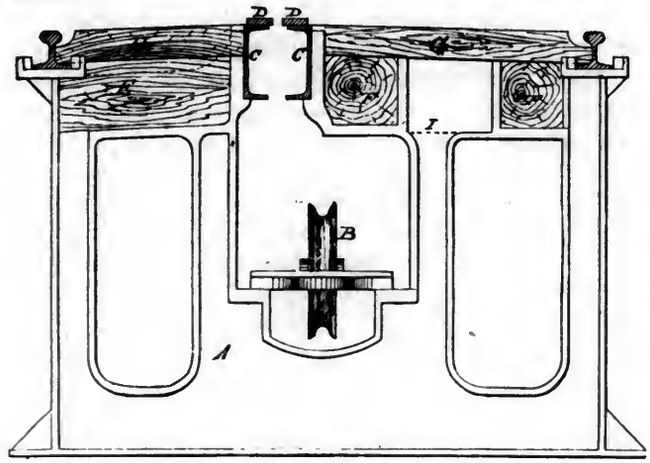


FIG. 1.

Fig. 1 shows one of the castings or frames with a section of the rails and channel irons forming the slot, or slot irons as they are now called. A is the casting formed of a flanged web, having three openings through it, one wide one in the center and a narrow one on each side, the center one being the outline of the tube, which is formed of concrete between one casting and another. The side openings admit of the concrete meeting and uniting, forming a monolithic structure the length of the tube constructed. B is the carrier sheave which carries the cable, and these are usually placed about thirty feet apart, having openings or hatches above them for access to remove or oil their bearings. C C are the channel irons forming the slot, and which are bolted to proper flanges on the frame A. D D are irons bolted to the top of the slot irons, the holes through which the bolts pass being somewhat larger sideways than the bolt, so that the irons can be brought nearer together or placed further apart to regulate the width of the slot. It is also intended whenever necessary to take off these irons D D, the openings below them being a little more than an inch wide, so that the rope or cable may be taken up at any point of the road. E and F F are sills which support the planks G H, which form the paving of the street, the top of the concrete being at I. This form of frame of cast iron makes a firm tie between rails, and also confines the rails and slot irons so that one cannot move without the other; this is necessary, as the shank of the grip which passes downward from the car through the slot and into the tube should be kept as near the center of the slot as practicable, on account of the friction and wear which would occur if the shank was pressed to one side or the other by the track or rails moving away from the slot on either side. It will be noticed that the slot is placed on one side of the center between the rails, while the carrier sheave B, which supports the rope, is in the center. The slot is placed on one side of the center for this reason.

On Clay street, as well as other streets in San Francisco, the crossings are level, no matter what may be the grade of the streets on either side of them, and where steep grades occur as on Clay and other streets, a sharp angle is formed at the crossings; now at this point, when the street takes a sharp grade up, the cable in the tube would, by the strain put upon it, be hauled up against the upper side of the tube, consequently an inverted carrier sheave is placed at this point to keep the cable from rubbing against the top of the tube. These inverted carrier sheaves are called "depression" pullies or sheaves.

Whatever gripping apparatus is used, the shank which comes through the slot must run on one side of the depression pulley, and the part of the grip which takes hold of the rope or cable must pass above the lower and below the upper sheaves. Fig. 2 is a sectional view of the part of the grip which is in the tube, and which takes hold of the rope. A is the shank, having the foot B at right angles, and on which slide the two jaws C C, which grasp the cable, and are separated or brought together by the wedge D, which is raised and lowered by the slide E, to which is at-

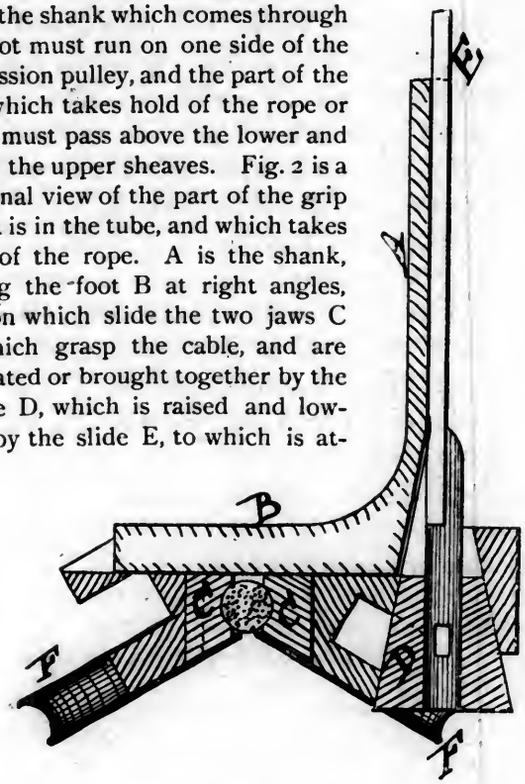


FIG. 2.

tached at its upper end on the dummy a screw on which works a nut operated by a hand wheel. It will be seen that if sheaves are situated directly above and below each other and in line with the jaws of the grip where the rope passes, the grip could pass between them if they were separated a little more than the vertical thickness of the grip at this point. This construction of grip, by which the jaw is located on one side of the shank, requires the slot to be out of line with the rope, so that as the cable is placed centrally between the rails, the slot requires to be placed out of center.

The shank of this grip is a bar about seven inches by seven-eighths of an inch in thickness, and extends downward from the dummy through the slot and into the tube, that part of the shank which in use is at the slot, being made somewhat thinner, so that there may be no pinch-

ing or binding between the edges of the irons forming the slot which, at the surface of the street is usually made three-quarters of an inch wide. It is sufficiently narrow to prevent any buggy wheel from dropping into it when passing above it. As before stated, this shank, which projects from the dummy into the tube, has a foot projecting at right angles from its lower end; this foot having the edges beveled off so that a frame (in which is fastened the jaw C, farthest from the upright portion of the shank) may slide. Within this frame is a short bar, also arranged to slide on the foot of the shank, and having fastened to it one of the jaws C, which is nearest to the upright part of the shank. Between this latter bar and the frame carrying the first-named jaw, is placed the wedge D. This wedge, with its base downward, is caused to act on the two jaws by drawing it upward and thus bringing the jaws nearer together, clamping the rope between them with any degree of force requisite. This wedge is drawn up and lowered by means of the slide E, which is a flat steel bar about three-eighths of an inch thick and two inches wide for a portion of its length, the upper part terminating in a round rod having a thread on it which passes through a nut operated by a hand wheel. This hand wheel being supported on the top of a hollow screw which is arranged to raise and lower the whole grip bodily when picking up the cable preparatory to starting on a trip. The relative movement of the rim of the hand wheel to the jaws which take hold of the rope is about five hundred to one, which has been found ample to take the cars over the steepest grades with their heaviest loads, sometimes consisting of seventy passengers.

(*To be continued.*)

A New Tramway Locomotive.

IN a recent issue, *Engineering* illustrates and describes a new tramway locomotive, designed by N. Scott Russell, a well-known engineer.

The small engine exhibits some novel features. The boiler shell is welded in one piece. The cylinders and valve motion are of an ordinary high-pressure pattern, but the steam is exhausted into a surface air condenser composed of 250 very thin copper tubes fixed in thin cast brass chambers. From this condenser any steam remaining uncondensed passes to a water tank in the front end of the engine, or into the smoke box, where it passes out free from noise. The speed regulating and brake mechanism are particularly effective, these matters having received special attention, to enable the tramway car to be operated safely on steep grades. A supplementary wheel placed between the drivers, and running on the rail, operates a speed governor and restrains the car velocity below ten miles an hour. All the machinery is carefully enveloped in casing, to exclude dust and grit from the wearing surfaces.

Tramways in Great Britain and Ireland.

THE total length of the street railways, or tramways, in England, Scotland and Ireland, is 669.6 miles, according to the last official report, of June 30, 1883. The total cost of construction was $48,750,000, including the rolling-stock and equipment of all kinds. The 141 lines are worked with 20,122 horses, 117 locomotives and 2,819 cars.

The Market Street Cable Road in Philadelphia.

PRESIDENT Widener, of the West Philadelphia Passenger Railway Company, appeared recently before the Railroad Committee of Councils, of Philadelphia, which met to consider the bill by which it was proposed to give the Market Street Line exclusive right to the north side of the Schuylkill River bridge. The power of Councils to grant such a right was questioned, and the matter was postponed until the Finance Committee had disposed of the new bridge project. Mr. Widener said that no exclusive right was asked over the new or temporary bridge. Said he: "We can't lay our tubing for the cable road over the bridge, and we propose to run the wheels over the floor of the structure, and in doing so it practically gives the company the exclusive use of the bridge, for nothing else could be driven over it. What we ask is only a temporary matter." With Mr. Widener's concurrence the word "exclusive" was stricken out. He said that what the company wanted was to have the cable road in operation in time for the opening of the Electrical Exhibition.

A Skidless Tram Rail.

WHEN the level of the roadway wears down below the level of the tramway rail, vehicles are very apt to jolt and skid when crossing the line of the rail. The effect is discomfort; wear and tear of carriages and horses is considerable, besides the great current expense to tramway companies and corporations in keeping the level of the roadway up to that of the rail. A new rail is designed to obviate these drawbacks, and, in addition, permit of rapid laying and relaying. The skidding of vehicles, when the roadway has sunk, is prevented by scolloping or inching the edge of the rail. The track for the tire of the wheels is as in ordinary rails, but the rail is fastened, at the ends of every length, to a longitudinal sleeper laid beneath it, by means of screws. These screws readily admit of the rail being tightened on its bed by means of a key, or of lifting and renewing the rail when the street has to be repaired or the rail is worn out. The improvement is English.

THE electric railway running from the Brighton, England, Aquarium about a mile along the Madeira-road, has been in successful operation over about 1,000 yards of its length for some months. During the Easter holidays it was most enthusiastically supported by the Brighton residents and the visitors, and it is in every way clear that the line will be looked upon by everyone, not only as an attraction, but as of very great convenience.

THE People's Horse-Car Railway Company, of Chicago, Ill., has been incorporated with a capital stock of $200,000. It will construct and operate a tramway from the corner of West Lake and Fortieth streets to Maywood on Lake street, and will also have lines on Waller street and Oak Park Avenue.

THE articles of incorporation of the Brooklyn Elevated road have been filed in Albany. The $1,250,000 bond loan has all been subscribed for. They were placed at $600 on each $1,000, with $1,000 worth of stock thrown in as a bonus. Work on York street will be pushed as rapidly as practicable.

New Inventions.

Automatic Gate for Railroad Crossings, Private Residences, Etc.

LAWRENCE C. WALSH, Webster, Massachusetts, has invented a gate for use at railroad crossings, and equally well as a private gate for residences. In the former case it can be operated by the locomotive, or by hand if desired; in the latter, the gate is so made that the weight of a horse and wagon will lift it. In the case of very wide railroad crossings, the inventor proposes the use of a double gate, parted in the middle, and to swing or run to each side of the road. His patent covers both the uses, and also the modification indicated.

The qualities which the inventor claims for his gate are cheapness, reliability, simplicity and labor saving. Its peculiarities of construction comprise a latch to hold up the pivoted track. A wire runs from this latch about eight hundred feet each way from the gate, on posts. The approach of the locomotive operates automatically to open the gate. To work it by hand, all that is needed is one wire attached to the loose end of the pivoted track and carried on posts to any easy distance. It is often seen that roads cross the track quite near country depots. In these cases, a wire could be made to run into the depot and the gate opened without the necessity of the man in charge of the matter, getting up from his seat. Gates after Mr. Walsh's plan of construction, can be built for forty or fifty dollars each, first cost.

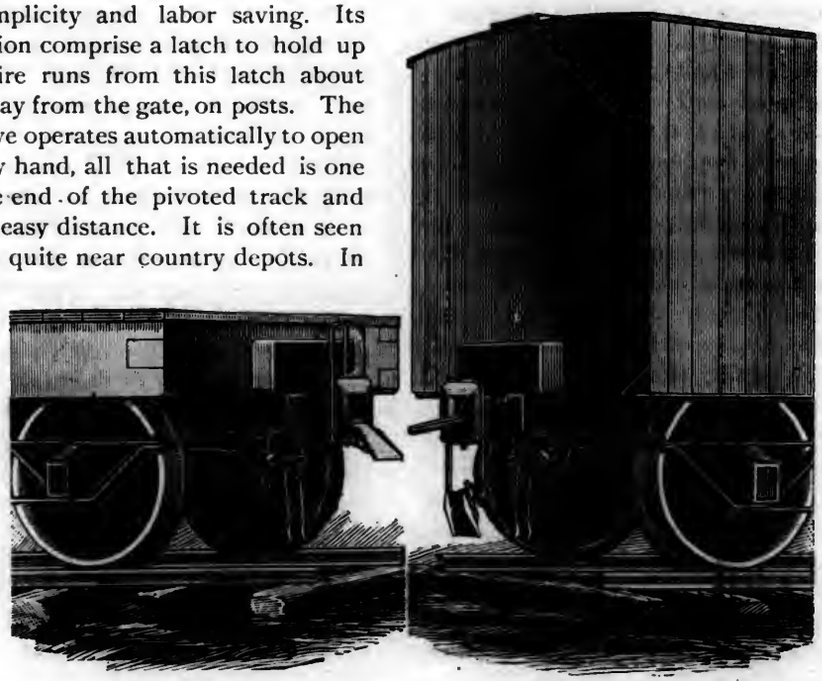
Unlike any device of the kind, so far as we are informed on the subject, the Walsh invention is unique in that nothing runs on the ground in connection with it. It provides a rail on the cab of the locomotive. The operation of this rail in connection with the rest of the apparatus before described is easily understood. As the locomotive approaches the gate, the rail on its cab touches the wire on the posts and thereby drops the track on which the gates run, thus causing the gate to close. When the locomotive reaches a lever arm at the gate, the gate is raised on the latch, leaving the road open for teams to pass. A second lever arm is provided which hangs down after the locomotive has passed. It is useful in case the train should stop and reverse its direction. Then it would be touched in such a manner by the passing locomotive, that it would automatically close the gate.

The J. C. Bryan Automatic Car-coupling.

IN using this coupling, there is no change to be made in the construction of the cars, draw-head, or link, and but a slight change in the coupling-pin. The coupling can be attached to the cars now in use without the removal of, or in any way interfering with the buffers or any part of them.

This attachment is durable and reliable at any and all times, on a straight or curved track. Each car is provided with three levers only, one on each side and one extending to the top, by which either or both ends of the car may be uncoupled by any one of the three levers.

When necessary, the coupling at one or both ends of the car can be locked to prevent the cars from coupling —all done at the ends of the levers. The levers, except the one extending to the top, work under the bottom of the car, and are never in the way nor liable to be broken. With this attachment cars can be uncoupled while running at any rate of speed or while standing. The cars make their own coupling when run together. Couplings can be made automatically with cars of different heights, and cars will always couple automatically where it is possible to couple them at all.



THE J. C. BRYAN AUTOMATIC CAR-COUPLING.

Another advantage is conspicuous in the fact that cars without this attachment will, when the link is left in them, couple automatically with cars that have the attachment.

The engraving is explanatory of itself. The link strikes the apron-guide, the apron throws the link into the opening of the draw-head, and the impact of the link against a trip-plate working in the throat of the draw-head, causes the coupling-pin, lifting frame, and apron-guide to fall, thus coupling the cars.

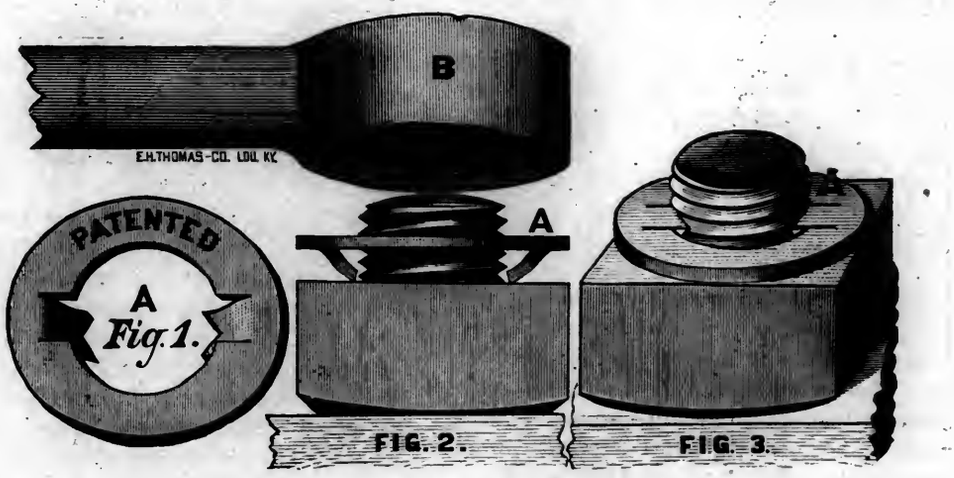
This attachment is the result of eleven years' constant study; experiments having been made with hundreds of models before trying it on the cars. It is the invention and patent of John C. Bryan, Holly Springs, Ark.

The Van Dusen Patent Nut-lock.

THE following cut and explanation give a good idea of a very simple and efficient nut-lock, patented by Mr. Chas. Van Dusen, of New Albany, Ind. It differs from any nut-lock heretofore invented in the way it attacks the difficulties to be overcome.

The opposition to the removal of the nut, instead of coming from below or to one side of it, as in most other nut-locks, comes in this case from the point where it would seem natural that such opposition should come, viz.: from outside the nut.

As the lock is driven flat upon the nut, as described in the diagram, and the tongues straighten out into the same plane as the lock, the teeth are forced into the body of the bolt, making a positive and secure fastening, such as is made by no other nut-lock. Although holding so firmly, this lock is quite easily removed, it being only necessary to lift each shoulder slightly by any tool forced between it and the nut, when the lock comes off without having occasioned the least injury to the bolt.



THE VAN DUSEN PATENT NUT-LOCK.

Fig. 1.—A, represents nut-lock detached. Fig. 2.—A, nut-lock in position ready to apply; B, the tool used in setting the lock—it is simply a bar of iron having a hole ⅛ inch larger than the bolt—when placed as indicated, one or two smart blows with a hammer on the tool force the lock flat. Fig. 3.—A, represents the lock applied.

This nut-lock has to be made of the best quality of steel; and while its action is positive and certain, making it a perfect nut-lock, yet it can be made and sold cheaper than even jamb-nuts or wooden washers. These nut-locks have been severely tested, one of the tests being their use for some months upon the "rattlers" used for cleaning castings in large foundries, where even jamb-nuts were inefficient, yet of these locks none have been started.

The patents have been purchased by the Peerless Manufacturing Co., of Louisville, Ky., who have already made adequate arrangements for the manufacture and sale of these nut-locks in large quantities, and will furnish samples upon applicatiou.

Malleable Castings.

THE firm of Jenkins, Law & Price, Melbourne, Victoria, have invented a system of making malleable castings. Articles required, having been first cast in "chill" molds in the usual manner, are then subjected to a heat of particular temperature and immersed in a bath containing an admixture of certain ingredients. Upon examination of the metal thus treated it is found to possess a beautiful soft, bluish tint, and to be entirely free from that hard scale characteristic of metal cast in the sand, while upon fracture the grain is discovered to be of a close, but soft and remarkably homogeneous texture, and to possess the dull gray color distinctive of steel.

In a paper recently read before the Victorian Chamber of Manufactures, Melbourne, A. P. Greaves said:

"Numerous experiments have been made with a view of ascertaining the susceptibility of the patent metal to the action of tools, and nothing could better demonstrate its wonderful softness and homogeneity of substance than the fact that a one-sixteenth inch twist-drill was, with perfect ease and without injury to the tool, driven half an inch into one of the bars; while, submitted to the action of a one-fourth inch punch, a plate three-sixteenths inch thick was punched several times, within an inch of the edge, without showing the slightest sign of fracture. Further experiments made with taps and dies showed that both male and female threads of very unusual completeness for cast iron could be made in this metal. Then, as to its behavior under the action of the lathe, it cannot only be turned at a 'brass speed,' but works up under the tool into a smooth, even surface, the metal at the same time coming away from the edge in fine curved shavings, instead of the usual coarse, brittle dust.

"In connection with the use of chill molds, it might at first sight appear that the expense of procuring the same would be an objection to the use of the newly patented method, but this idea will immediately disappear when it is pointed out that the new process effects a material saving in no less than the following six different directions: (1.) Economy of space. It will be at once evident that, with the use of chill molds, one corner of a shop will be sufficient to execute a job that, by requiring a whole host of sand patterns, might under the old plan occupy half the building. (2.) Reduction of plant in such articles as molding boxes, molders' tools, and so forth. (3.) Reduction of labor. This follows so self-evidently upon the preceding item as to require no further explanation. (4.) Rapidity of production. It is almost super-

fluous to point out that with the use of the "chill" mold castings can be produced at a speed of at least ten times what was possible by the old, tedious method of sand casting. (5.) Saving in material, through the great increase of strength in the same. To make this clear it is only necessary to take the case, for instance, of a bracket which, in order to sustain a weight of, say, one ton, has hitherto required to be of a certain bulk, but which now, by reason of a large increase in the strength of the material can, of course, be reduced in thickness to an exactly proportionate extent. (6.) Saving in cost of tools. The economy in this direction may not at first appear very evident, but a little reflection will show—especially to those whose particular line necessitates a heavy expenditure on the item of files for fettling and trimming purposes—that the absence of the hard scale found in ordinary sand castings must result in a very considerable reduction of outlay in the direction pointed out.

"Especially in the United States, where cast-iron wheels are in almost universal use, the extra strength of the new material will prove of great service, while its soft and homogeneous quality will render it particularly adapted for such articles as slide-valves, slide-blocks, and even valve-seats and eccentric tumblers."

The new invention has been patented in this country.

Foster's Steam Boiler Cleaner.

J. H. FOSTER'S (Era, Texas,) Steam Boiler Cleaner is a simple device, consisting of a pipe running the entire length of the boiler. This pipe is placed as near the bottom of the boiler as the rivets will allow. It has apertures on its under side, a cup and bolt at one end, and bushing at the other. The outer fixtures, with the throttle or other value, can be adapted to the boiler to which they are applied. It does not matter at which end of the boiler the valve opening is placed. The inventor considers that one pipe is all that is necessary in fitting small boilers with his improvement, but large ones may require two or three, either connected with the same outlet or having each a separate one. In this case the area of all the holes should not exceed that of the valve opening. The upper pipe should be placed about one-half inch above the water line, so that when the valve is opened the foam is sucked through the small holes and thrown out, and in like manner the mud unloaded from the bottom. The valve should be blown for the space of a quarter of a minute three or four times a day. This is no more trouble than to try a gauge cock. Mr. Foster suggests that for railroad use, or in long boilers in which the valve might be in the way, it would be best to connect the pipes in the middle of the boiler by a tie, and attach a curved pipe to the tie, adapted in form to the circumference of the boiler. This pipe should lead out at the top of the boiler, with bushing and fixtures as before described. One advantage of this plan of connection is, that it entirely obviates injury from freezing.

The advantages claimed for the device we have described are its simplicity, placing, as it were, a blow-off cock at every six inches of the boiler's length; its cheapness, ease of application, its being automatic in operation, never requiring to stop or empty the boiler in order to clean it, its durability, and its being placed inside the boiler and so out of the way.

A Safety Truck Lock.

A NEW appliance for insuring greater safety in case of railway accidents was tested on the Canadian Pacific track at Hochelaga, recently. The invention, known as the Wilson Safety Truck Lock, is intended to prevent cars, in case of being thrown off from the track, from slewing around and running down an embankment. It was tested on freight car No. 2,300, on a sharp curve, the track being broken so as to derail the car when going at a speed of fifteen or twenty miles an hour. The car simply bumped along on the ties for forty or fifty feet, and then came to a standstill, none of the wheels being more than thirty inches from the rail it had left. Mr. Baker, superintendent, Mr. Shaughnessy, assistant manager of the Canadian Pacific, and other railway and public men who were present, expressed themselves well satisfied with the test.

Car-Couplers Regulated by Law in Massachusetts.

THE following law has been passed by the Massachusetts Legislature, and approved by the Governor;

SEC. 1. Every railroad company operating a railroad, or any portion of a railroad, wholly or partly within the State, shall place upon every freight car hereafter constructed or purchased by such corporation, and upon every freight car owned by such corporation of which the coupler or draw-bar is repaired by it, with intent to use such car, such forms or form of automatic or other safety coupler at each end thereof as the Board of Railroad Commissioners may prescribe after examination and test of the same, and the Railroad Commissioners may annul any recommendation made by them.

SEC. 2. The provisions of this act may be enforced by the Supreme Judicial Court on application of the Attorney-General.

SEC. 3. So much of this act as relates to the examination and test shall take effect on its passage, and the same shall take full effect on the first day of March next.

The following circular, dated Boston, May 15, has been issued by the Massachusetts Railroad Commission:

By an act of the Legislature, approved May 8, 1884, all new freight cars owned by Massachusetts railroad companies are, after March 1, 1885, to be equipped with automatic or other safety couplers, approved by this Board, after examination and test thereof.

The Commissioners will, on Sept. 25 next, hear at their office, No. 20 Beacon street, Boston, all parties desiring to set forth the merits of any safety coupler, and also any criticisms thereof by experts, and they will witness tests of such devices to be made in or near the city of Boston. The hearing will begin at 10 o'clock, A. M. Records of the working of safety couplers in actual use for traffic are especially desirable.

THE organ of the "Order of Railway Conductors," published at Elmira, New York, is a monthly with a useful mission. Its contents, outside of those immediately appertaining to the business of the association, are of the right sort to entertain and edify the readers for whom they are specially prepared. The spirit and feeling of the *Railway Conductors' Monthly* are very praiseworthy, and its appearance is a recommendation. We cordially hope

GEO. H. HOWARD,

Counsellor in Patent Causes and Solicitor of Patents.

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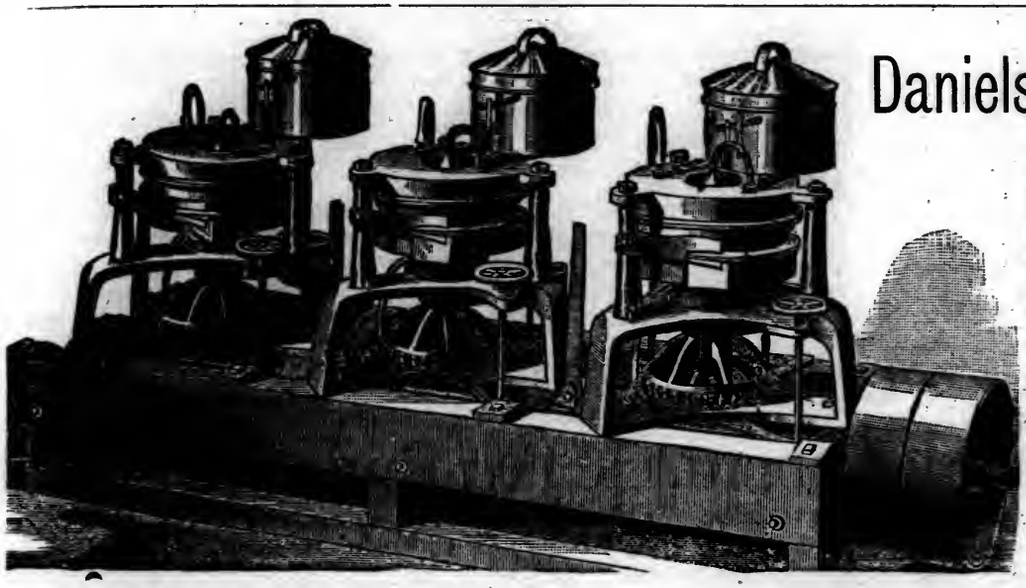
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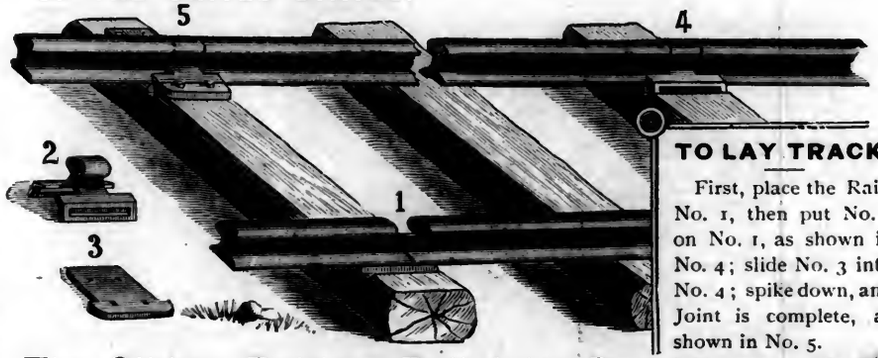
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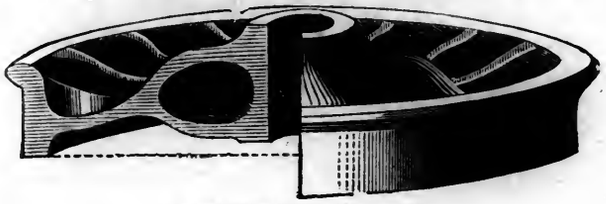
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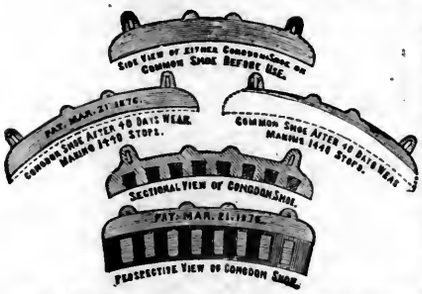
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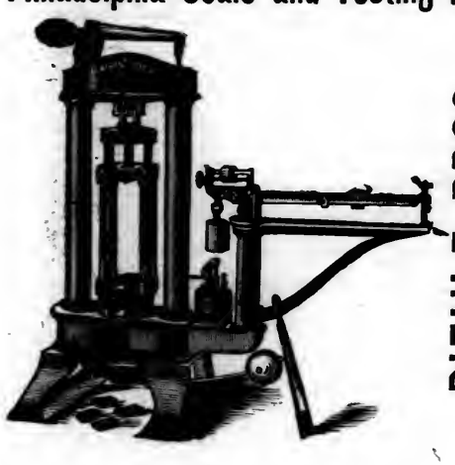
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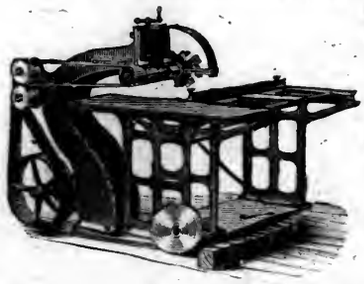
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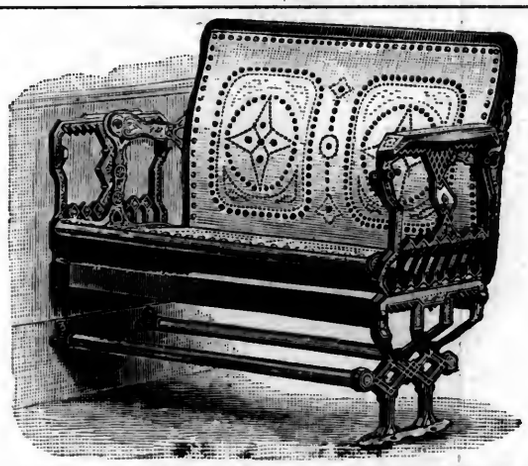


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WHOLE NO. 2,554.] NEW YORK, JULY, 1884. [VOLUME LVIII.—No. 4.

RAILWAY PROTECTIVE ASSOCIATIONS AS COMPARED WITH INSURANCE.

BY JAMES M. GARDNER.

(Written for the AMERICAN RAILROAD JOURNAL.)

UPON a casual perusal of the various journals published in the interests of the different railway protective and benevolent associations, I have been much struck with the good work they have accomplished in providing death funds and periodical payments in case of accident or illness. Apparently not a single claim has been presented for pecuniary aid of this nature that has not been promptly met with payment, and the usefulness of the organizations is thus unquestionably demonstrated. The mutual pledge of men engaged in the same calling to aid each other in times of distress is one of the pleasantest features of associated labor, and no greater incentive exists for the encouragement of generosity and personal honor than the system of mutual benefit associations.

The superior intelligence of railway employés in almost every capacity, doubtless has great weight in rendering the advantages of this mutual aid so marked and successful; and for that very reason it is quite possible that they have misunderstood the nature of the aid which they furnish and receive. Under the principle of assessments, by which, I presume, these beneficiary funds are collected, each man by his contributions in aid of others, is entitled to receive aid when his own need for it is presented. Notwithstanding the benevolent features of the organization of which he is a member, the element of business is nevertheless present. He is *buying* something with every assessment he pays, and it would be well for him to consider the nature of the thing purchased. At the outset I will state that he is not buying insurance in its proper sense.

Among men of that class which are fairly represented by railway employés—whether they be locomotive engineers, firemen, conductors, brakemen, trackmen or carbuilders—legitimate life insurance companies find great difficulty in obtaining policy-holders. Their agents and canvassers are met with the statement that the person whom they approach is already insured by being a member of this or that railway benefit association or brotherhood, and therefore has no occasion to take out policies of either life or accident insurance in any of the numerous companies doing a general business. I have no doubt that this membership will, in the majority of cases, answer nearly every purpose of a policy of insurance, and as little doubt that the benefit and protective associations are conducted with as scrupulous honesty as the best life insurance companies; but its members should not confound the aid which is promised them, with insurance, for it is a very different thing. A railway employé should by all means become a member of the association composed of fellow-workers, but he should also, if possible, insure in some insurance company of good standing. Thus he will be the recipient of two kinds of protection, which, while designed for the same ends, are entirely dissimilar in their nature and operation.

The aid promised by the benefit association, to the family of the member in the event of his death, and to himself in case of accident or illness, is a guaranteed aid, not an insurance. In the majority of cases it will answer the purpose for which it was intended, but it has not the permanence which characterizes insurance. If the member abandons his connection with the association, either through choice, expulsion, or change of occupation with which his previous membership is incompatible, he at the same time abandons all claims to future aid, and thus forfeits all the advantages which his payments in the past had secured to him. Through some misfortune he may be unable to meet an assessment while still a member of the association, and we presume that in accordance with the usual custom of such organizations he cannot realize any benefits while his payments are in arrears. There are, perhaps, a number of these organizations which do not collect the benefit funds by means of assessments, payment in this case being made direct from the treasury which is constantly replenished by means of fixed weekly, monthly or yearly dues; but the fact nevertheless remains that an abandonment or deprivation of membership in the association is accompanied with a forfeiture of all future benefits which past payments have secured. In legitimate insurance this is not the case. In nearly all of the States, stringent laws have been passed which preclude the possibility of forfeiture under any circumstances save that of deliberate fraud on the part of the policy-holder; and it is the universal practice of all reputable insurance companies to provide various ways by which returns of one kind or another are absolutely assured upon the payment of the second or third yearly premium, no matter if the insured sees fit to let his policy lapse immediately thereafter. This return may be in the form of what is called a "cash surrender value" in which is returned to the policy-holder a sum in cash varying from fifty to eighty or ninety per cent. of the amount paid by him in the shape of premiums, the percentage increasing with the age of the policy; or the insurance, whatever its nature, may be extended for a definite period without the further payment of any premiums, until the insured has received in insurance, an exact *quid pro quo* for all premiums hitherto paid. Still another return is commonly offered to policy-holders in event of their inability or unwillingness to continue payments, in the form of a paid-up policy for a definite sum, which he is then considered to have bought outright by the payment of his past premiums, and which he may hold with absolute security without further payment, until he himself or his heirs draw the money payable upon its maturity. Various other means are often provided by which the policy-holder is assured a benefit no matter what may

occur, and it must also be borne in mind that over his membership in a life insurance company, the company itself holds no control. It is impossible for his membership therein to be dissolved save with his own consent. Thus will be seen a few of the advantages which legitimate insurance companies possess over mutual benefit and industrial associations, no matter how honestly the latter may be conducted.

It will be seen that I have carefully used the word "legitimate" when speaking of the advantages offered by insurance companies. I do so to distinguish them from the so-called "cöoperative" insurance companies which are blots on the insurance business. To everyone I would say, shun these last named organizations which are constructed on the model of railway mutual benefit associations, but which possess none of their advantages, while their disadvantages are present to an abnormal degree. A cöoperative life or accident insurance company collects its funds by assessments levied whenever a policy matures. Its managers may be the personification of honesty and intelligence, but they are absolutely powerless to enforce the collection of the assessments, and the policy-holder is dependent upon the inclinations and abilities of several thousand of his fellow members to secure the payment of his policy. In the assessment feature there is a resemblance between the cöoperative concerns and the railway associations, but the latter from the nature of their membership are infinitely superior in the character of the aid guaranteed. There is an *esprit de corps* about the railway association. Its members are pursuing the same calling, and a feeling of fellowship is fostered and engendered. Its officers and managers in most part serve gratuitously, and are conspicuous for their honesty; and the desire of its members to aid each other is followed by a prompt and generous payment of levied assessments. The members of a cöoperative insurance company are unknown to each other. There is a lack of any feeling of fellowship, and a dense ignorance as to the workings of the organization. Its officers and managers are paid generous salaries, and as a rule are not scrupulously honest. The companies possess not a single advantage which the railway benefit associations do not offer a thousand fold superior, and present drawbacks which are lacking in the latter.

If I am anxious to distinguish the advantages of legitimate insurance over the aid guaranteed by the railway associations and others of the kind, I am doubly anxious to avoid the confounding of insurance with the misty guarantees of the cöoperative concerns. In legitimate insurance each policy-holder deals directly with the company and there are no assessments. He pays for what he gets and he gets what he pays for. The equitable amount of his premium payments has been established through the experience of more than a century, and he has the satisfaction of knowing that he has a guarantee of the payment of a certain sum; not the promise of an effort, more or less feeble, to collect it in driblets from a thousand or more persons.

It is the legitimate insurance in whose favor I am writing, and I trust that it will not be confounded with any other form of aid which has adopted the generic name of insurance. But at the same time I do not wish it thought that I am arguing with an intention to damage the cause of the railway mutual benefit associations. They are of the greatest usefulness, morally, socially, and benevolently, and if a railway employé cannot afford both insurance and a membership in his association, by all means forego the insurance. It has been my object to distinguish the two in their nature and operation, and to point out the fact that insurance possesses advantages which the associations cannot furnish; and to call to the notice of all whose means will permit, the benefits which will accrue to them if they are not satisfied alone with the protection which their associations offer, but secure permanent and unfailing protection for themselves and their families by laying a portion of their means aside to obtain legitimate insurance. It is to this end I have directed my efforts, and I trust they have not wholly failed of their purpose.

AMERICAN VERSUS BRITISH RAILWAYS.

BY HENRY G. TAYLOR.

(Written for the AMERICAN RAILROAD JOURNAL.)

IN your last issue, "An Old Traveler" communicates a remarkably interesting article under the above title. He writes in an admirable spirit of fairness, and enriches railroad literature with luminous information. If, to a wanderer like myself, whose business and habit are observation, there are spots in the sun of his discourse, its merits of candor and breadth are so conspicuous that it would be ungracious to more than mention them. Moreover, in my opinion, his comparison is so nearly exhaustive that I feel little more need be said to place the matter under discussion in, at any rate, approximate completeness before the reader. At the same time more might be said in justice to an important subject than has been printed as yet, and, as I venture to believe that I have some new points to communicate to a discussion which in these days of much travel can scarcely become wearisome, I proceed to set them down, not in a spirit of controversy, but, I trust, with a dutiful regard to "whatsoever things are true."

The conditions of travel in the United States as compared with those existing in Great Britain, are so different that the distinctions developed since the institution of railways must of necessity be great, the progressive spirit being regarded as equal in both. I think that it would be fair to state it is about equal. In the course of my visits to Europe every few years, I cannot fail to see that British energy and enterprise are exemplified in the way best adapted to the needs of the country in at least as remarkable a degree as here.

In nothing are these more noticeable than in the improvements effected in third-class carriages, which are placed at the service of Her Majesty's subjects at the rate per mile of about two cents for each person. As every train is provided with a sufficient number of these carriages, I cannot do otherwise than believe that traveling is cheaper in Great Britain than here. In this country the rate per mile in the ordinary cars varies from somewhat above two cents to five cents on some lines, and I feel confident that to strike an average would be to demonstrate the truth of my statement. But this by the way. "An Old Traveler" says third-class carriages in England are "unspeakably vile." I question this statement. Many people in a good middle-class position in life use them,

especially in what our British cousins consider long journeys; and I venture to say that while there are specimens of old shabby boxes still used in local travel, the majority of the penny-a-mile carriages answer to the description I am about to give of them. They are sufficiently spacious for people to ride face to face in them with comfort. The seats are wide and shaped to the person, neatly upholstered, provided with racks, and, many of them, with drapery for the windows. They are kept clean, are certainly not soiled with tobacco juice, and as a general thing, are not full, so that the passenger has more freedom than is conveyed in the description that they are "stuffy little boxes into which the passengers are locked like a herd of cattle." Many a man who would not think of traveling at sea other than as a first-class passenger, makes himself comfortable in a third-class carriage while traveling in England. It is more than possible, not to say probable, that he may find himself the sole occupant of a box. In this case, should he be traveling by night, he might make no uneasy couch by the aid of his traveling robe, and journey from London to York, for example, swiftly and smoothly, nor unsuccessfully woo that benign goddess, sleep. For short journeys, and in a densely populated country like England, the vast majority of passengers traveling a few miles only at one time, the inconvenience of riding in a third-class carriage is certainly not greater, should all its seats be occupied, than that of accomplishing the same length of journey in an ordinary car in the United States, compelled here as there, to sit next the same person all the way, or lose the chance of sitting in a seat which ten to one cramps the body, and the iron frame of which is far from suggestive of comfort. What is here said is not intended to be a defense of the construction of carriages preferred by English railroad managers, and by the public also, but in order to inform the American reader, who, naturally enough, is apt to form an opinion of British traveling arrangements as flattering to those in use in his own country as possible.

But I am not losing sight of the fact that the compartment style of railway carriages does possess great advantages, especially where many trains have to be filled and emptied. Side doors very materially assist rapid dispatch, as no one can fail to observe who occupies a seat on the station platform of King's Cross, London, for example, and notes with assured admiration the astonishing expedition with which trains are filled and sent off, and the equal rapidity of disposing of a crowd of arrivals. Our system would not answer the needs of the English service nearly as well, and this remains true notwithstanding that the tickets are there checked by the "guard" or conductor before the starting of the train. This well-uniformed and busy person, moreover, is provided with a platform along the side of the carriage, on which he can walk without danger while the train is moving slowly, and it is not absolutely necessary that ticket checking and collecting should be done when it is standing. It being also remembered that when standing in the station the floors of the carriages are on a level with that of the platform and close to it, anybody can see that leaving or taking train is a much easier matter in England, and a more graceful and comfortable thing too, than climbing up a staircase into the car from a dusty or sloppy track. Ladies, especially, appreciate the difference. This matter of side doors is capable of further treatment. End doors to cars are frequently opened, causing a draught and a storm of dust; and let me say, without expansion, that traveling is cleaner in England than here, and that there the unæsthetic duster is not a necessity to the passenger who sets a value upon his broadcloth, or is apprehensive of mischief to her draperies.

I do not think it would be profitable to extend this discussion by mentioning other points of superiority in English railway service, as this was so faithfully done in the JOURNAL last month. In making a comparison between ours and that, the essential difference between the continental vastness of the United States and the comparative paucity of its population, and the characteristics of compactness and close-peopledness in England, should be borne in mind; our people take much longer journeys on the average, our companies provide fewer trains, and they carry fewer passengers per mile by an exceedingly large proportion. I see unwisdom in the Britisher prescribing what our railway methods should be; I see equal unwisdom in the American dictating what English railway methods should be. Companies in both countries have much to do before they provide as perfect a service as is desirable; but I do not hesitate to express the opinion that both are, as nearly as I can judge, equally intelligent and enterprising in the adoption of improvements. Both can learn the one from the other, and one can but feel in dismissing a subject both interesting and useful, that the bard was right when he said: "Comparisons are odious."

THE STORAGE AND TRANSPORTATION OF POWER.

BY GOODWIN C. RUSSELL, M. S.

(Written for the AMERICAN RAILROAD JOURNAL.)

THE application of motive power to railways and tramways cannot be considered without the greater portion of thought being bestowed upon the subject of the storage of the power in question. Nor is the storage of the power the only subject which directly bears upon its application. There is also the transportation of power which demands consideration. Steam as a motive power had long been employed before the first railway or steam vessel was thought of, for the reason that while it is a comparatively easy task to apply a known force directly as a power, more study must be applied to effect a means of storing the power, and more yet to adapt it for transportation. Scientists in the early years of the present century, readily admitted the enormous force of steam as a motive power, but at the same time there was an almost universal belief among them that it could never be adapted to vehicles, as the increased weight of the necessary mechanism would more than compensate for the power thus applied, to say little or nothing of the weight of the vehicle itself. It was thought and argued that no machine run by steam possessed sufficient force to move itself, and that an increase of force was inevitably attained by more than a corresponding increase of inertia. The familiar comparison was instituted that an engine could no more propel itself than a man could raise himself by his boot-straps, and this *reductio ad absurdum* argument was deemed unanswerable until Stephenson's locomotive and Fulton's steamboat proved its falsity.

With the destruction of this fallacious theory a new field was open to investigation, and in the interval since locomotives and steam vessels were invented there has scarely a single month passed in which the world has not been benefited by the discovery of some new and useful appliance tending to perfect the means of applying steam as a propelling power. The weight of propelling machinery has been reduced to a minimum; its power to a maximum. No sooner has the necessity arisen for a new device to solve a minor or technical problem connected with railway or any species of steam transit, than the inventor has appeared able to furnish the desideratum. But now, as in the early days of steam transit, the storage and portability of power is a great and leading question upon which the study of scientists is constantly applied. I cordially agree with the JOURNAL in the prediction made in its editorial columns last month that steam is doomed. The world has progressed, and what seemed to meet every desire and necessity fifty years ago, is now behind the age. Electricity is the coming force which will ultimately usurp the realm of steam as a motive power, as it almost has that of gas as a means of lighting. There are to-day electric motors whose achievements are wonderful, and experimentally applied, electric railways are already in operation; but the application of electricity as a motive power possessing all the requirements that are demanded in the propulsion of carriages and vessels (and which to a great extent are possessed by steam), is an achievement of the future. As a mere power it is conceded that electricity is superior to steam. Its capabilities are far greater and in its use there would be found greater advantages. Ultimately electricity can be furnished at a smaller cost, and the waste of material could be reduced to *nil*. All of these claims of the superiority of electricity to steam as a motive power are well-known, yet the electric motor and the electric vessel of to-day are very primitive affairs. The problem of electric storage and its transportation as a power yet demand a satisfactory solution.

The spring as a power antedates steam, and yet at present it does little outside of furnishing the motive power for watches and clocks and other forms of mechanism requiring the smallest exertion of force. A spring might be constructed that would propel the heaviest locomotive and the most cumbrous vessel, but its weight would be enormous aud the power required to wind it far in excess of that which it itself would furnish. As applied to street-cars the spring could, I think, be used with success, but even here the storage of the power and its transportation would present obstacles.

Light, in itself, furnishes a motive power, and Ericsson, the inventor, has constructed a sun motor which derives its force from the rays of the sun. Many of us are also familiar with the little device consisting of two or more discs, painted black upon one side, connected with slender bars so arranged as to meet at a pivotal center and revolve with the least possible friction. Enclosed in a glass case, to exclude the action of the atmosphere, and exposed to the rays of the sun, the discs will revolve with great rapidity, the darkened faces approaching the sun and the light receding from it. Here is a power, but its utility is questionable. Once again is its storage a problematical achievement, and, as in the case of the spring, a sun motor sufficiently powerful to accomplish any practical results would be too cumbersome for transportation, and would possess the insuperable objection of being available only during those hours when the sun's rays were unobscured.

The primitive powers are those which nature furnishes equipped for use; wind and water. History teaches us that there has been no civilization, no matter how primitive, which has not utilized both of these natural forces; but their utility has increased but little with the growth of centuries, and the storage and transportation of wind and water power seems an utter impossibility. Water has never been utilized as a propelling force and wind, in that capacity, has been strictly confined to sailing vessels.

Heat, compressed air and gas, have to a considerable extent been successfully utilized as propelling forces, but they fall immeasurably behind steam in their capabilities, and the obstacles in the way of their storage and transportation are more marked. Like steam they are rapidly being superseded by electricity, and little inventive genius is being directed toward their improvement.

Were it necessary other forces could be enumerated, all of which possess every requisite save their adaptability in the matter of storage and transportation. It is not to the discovery of new forces that inventive energy should be directed, but to the utilization of known forces, by harnessing them properly for action. Power exists in abundance; its subjection and mastery is the task which demands completion, and at the outset these questions present themselves for consideration: which of all known forces offer the most promising inducements for investigation, and which, up to the present time, are best understood, both as to their peculiar properties and as to known results of which they are capable? Let these questions be carefully studied before investigation is begun, and much misdirected labor will be averted. While future years may revolutionize the application of forces, we are dealing with the present, and dealing with it in the light of present knowledge; and immediate practical results can best be realized by investigation of the known, rather than by attempted discovery of the unknown. Discoveries come fast enough but their development is the work of ages.

To my own mind the conclusion is inevitable that steam is the only propelling force that can at present be utilized, but that the termination of its era will soon be brought about by the universal application of electricity. As in the early days of steam, the question for mechanics and electricians to consider is the storage and transportation of electricity; but in one respect the difficulties to be met and overcome are not so perplexing as they were to Stephenson and Fulton and the early pioneers of steam transit. Not only in the perfected machinery and mechanical knowledge of to-day is their labor already partly performed, but, if I may so designate it, they are dealing with an intelligent force. Unlike steam, which demands heat as a *sine qua non* of existence, electricity springs into life endowed with a sense of its own and an unerring instinct. It may be dispatched along a wire thousands of miles in length, relied upon to perform its journey unassisted. Transmitted to a bar of metal it permeates every fibre and can instantly be utilized. Generated in an instant it acts upon the instant and with an overwhelming force. For this reason the transportation of electricity as a propelling force is but a secondary question, depending wholly upon its storage. In its application to railways it need not be transported at all, in fact, in the sense of carried, but can be transmitted through the rails themselves

from a central storage depot. When once successfully stored it may be applied with far simpler mechanism than the use of steam demands, and absolute safety is assured.

With you, gentlemen, the electricians who are so devoted to the development of that mysterious force, rests the solution of electric transit. To you are given its problems with their mingled simplicity and complexity; but in the light of past achievements, accomplished when the mechanical and inventive world was laboring in ignorance, there seems to be no limit to the great results you may accomplish. Surely it cannot be that the problems of electric storage and transportation are insoluble, and that these obstacles will daunt your perseverance. You have virtually superseded gas, and in a few years electricity will be the universal illuminating power. Continue your work and relegate steam as a propelling power to the past. It has served its purpose well, but the world is moving and so are its inhabitants who long for a new dynasty of force, and upon the completion of your task, and with the first successful application of electricity to railway and water transit, steam will be forgotten with the world-wide cry of "the King is dead; long live the King!"

RAILWAY STATION ARCHITECTURE.

BY M. G. VAN RENSSELAER.

[From the *Century*.]

THE railway station is a far more recent invention than even the inclosed theater. It is a child of our own century—a child of that century in which the engineer, as opposed to the architect proper, has come to play so large a role. It is unfortunate that there is this distinction, even opposition, between the two professions—unfortunate that with the advent of the railway age the architect allowed to pass entirely out of his control those structures which the engineer had of necessity to do his part. The consequence is that while this part is often performed in the most admirable way, the part which should have been the architect's falls as well to the engineer—to him who as an engineer cannot comprehend it, whom an architectural training alone would have fitted for its mastery. Nothing could be finer in its way than the interior of many a great station, especially in Germany or France, with its colossal, powerful, yet light and graceful iron framework. But such a framework can hardly be called architectural. It is spun, woven, wrought, rather than truly built; and the adjacent parts which are built commonly fall far below it in excellence and beauty.

I have already spoken of our Brooklyn bridge, which is beautiful in those features that fell naturally to engineering skill, in the lines of its cables and wires and in the delicate spring of its long roadway—as vital and graceful as though it were but a single tense strip of steel. But the towers—the really architectural features—are as poor as the iron web is fine. So it is with our great railway stations. Their walls and constructive features usually are bad *per se*, and have no organic relation with those other parts which we must be content to have unarchitectural themselves, but which might be brought into harmony with their architectural environment. A better accord between the two professions, or a wider training which will make certain men at once architects and engineers, may yet, it is to be hoped, produce more fortunate results. Exceptions to the general rule there are indeed already, especially in Germany, where we find certain great railway termini that are built with a dignity, a simplicity, an appropriateness, and an expressiveness that deserve all praise. Unfortunately we have not much to show at home as yet, beyond abortive attempts in the same direction—stations like the one at Worcester, Mass., for example, which means well, but the effect of which is, to say the least, unbeautiful. And even these are comparatively rare. So far as I have been able to judge, we usually vibrate between ambitiously inappropriate and ugly efforts, like the Forty-second street station in New York, or platitudes of an unambitious and factory-like description. A variant we do find, indeed, in the Broad street station at Philadelphia, but not a quite successful one. With its well-planned, comfortable, and even sumptuous interior we have no fault to find. It is a striking proof, by the way, of our growing demand for luxurious surroundings—a proof that would astonish the original creators of the Pennsylvania Railroad or the travelers of a generation ago. The exterior of the building, too, has excellence, if we consider it from an abstract standpoint; and certain among its features, prescribed by necessity, have been so fortunately fashioned as to be amply expressive—I mean the basement, with its great arches for the admission of vehicles, and the large windows which light the waiting-room above. But the expression of the building as a whole is far from being what it ought to be. A railroad station, above all things on earth, is utilitarian. It may and should be made beautiful, but its beauty should be of a simple, severe, and, so to say, business-like character. But for this Philadelphia station a florid type of Gothic was chosen, and was elaborated in the most ornate fashion. The design is good in many ways, and a great deal of the decoration is quite charming, intrinsically considered. But the effect is not in keeping with the structure's purpose. We gladly accept the Messrs. Wilsons' building as distinctly ornamental to a city which is in rather bad need of architectural adornment; but we cannot accept it as a laudable precedent in its own way. It is attractive, but I do not think it is very rational.

Our smaller wayside stations offer, of course, very much easier problems. They are merely waiting-rooms flanked, perhaps, by external sheds to protect the passengers and traffic; and there is, therefore, no question about bringing them into harmony with huge engineering efforts. Some improvement has been made in them of recent years, but there is room for more. The best among them are rarely more than pretty "Queen Anne" cottages, well arranged within, but hardly laying claim to architectural dignity. But more substantial work is coming into vogue, as we may see, among other instances, in several small stations Mr. Richardson has lately been building in New England. The one at Palmer, Mass., is the finest I have seen—built of stone of two colors, massively, effectively, yet simply, and in expressional accordance with its purpose. Unfortunately it is not yet complete, and cannot here be reproduced. In its stead we give a sketch of a still smaller one at North Easton.

At first sight, perhaps, the great stone arches look too "original" to the quite sensible. What is their use we ask, since there is only a roof to be supported? But they

serve good practical purpose in admitting light to the waiting-rooms in spite of overhanging eaves, and they are expressionally fortunate too, as it seems to me. Is not the general effect of the building just what it should be? Do we not see that it is the roof, not the wall, which is the main thing; that here is not a place to dwell in but to stop under; that it is not a house at all but a shed—a shed made permanent, stable, sturdy and picturesque besides? And I must enforce the point that in such work as this Mr. Richardson, who can be so exuberant at times, and at times so refined and elegant (as in Leroy Hall for instance), changes his tone entirely and becomes eminently business-like, uncompromising and severe. The Palmer station is much more ambitious than this, but it, too, is strictly utilitrarian, though by no means inartistic, depending for its effect entirely upon its structural features and the contrasted color of its materials.

If we have had one class of structures which more than another has been the very type of sordid, shabby, brutal ugliness, it has comprised those hideous receptacles for a long-suffering community known as the ferry-houses of New York harbor. But even these are coming under the healing touch of art. I may note as the most striking instance a ferry-house of Messrs. Ficken & Smith's at Hoboken—a modest wooden structure, nicely built, tastefully decorated, and showing a street front in "Queen Anne" fashion that is pleasantly picturesque and sensible withal. Here for once we have been given a sufficiently agreeable resting place for decent human creatures; and could there be a stronger proof that the good leaven is at work, and in a really radical way?

FUEL ECONOMY WITH LOCOMOTIVES.

BY ANGUS SINCLAIR.

READ BEFORE THE RECENT CONVENTION OF THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

DURING the last twenty years, remarkable reduction has been made in the cost of moving railroad trains, and an important portion of the saving effected in transportation expenses is due to the labors of this association. While there is just ground for pride over past achievements, the work must still go on, for great progress must yet be made in the line of economy.

We have heard much said of late about the keen, close competition which our food producers are going to encounter in the near future from the breadstuffs raised by the cheap labor of Russia and India. A factor in this problem, perhaps more important than the original cost of production, is the cost of handling and transportation to market. The vital struggle in this race will probably be decided by taxing the ability of our railroads to make still greater reductions in the cost of moving the produce of our Western farms to the seaboard. As the locomotive department nearly always receives the first attention when a demand for reducing operating expenses arises, I shall endeavor to suggest how important savings might be effected without impairing the efficiency of the service.

Although the American locomotive compares favorably with the average stationary or marine engine in the economical application of power, there is still room for improvement, as can be proved by a comparison with the work done by locomotives in Europe of similar dimensions to ours, while doing similar work.

During the month of March last the engines running the Chicago Limited Express on the Pennsylvania Railroad, between Jersey City and Philadelphia, burned 63.35 pounds of coal per train mile. Some engines on other roads doing similar service, and burning bituminous coal, show a slightly better duty; but the Pennsylvania locomotive may be accepted as a fair average of American locomotive practice, with two or three notable exceptions. On a good representative road in this country a Mogul engine, with cylinders 18 x 24, pulling twenty-five loaded cars, on an average, burns 120 pounds of coal per mile. This may be considered among us, fair economical work for a freight engine.

The famous Webb compound locomotive, on the London and North-western Railway, has been running a train of about the same weight and speed as the Pennsylvania Railroad's Chicago Limited Express over a road quite as hard to operate, with a fuel expenditure under 30 pounds to the mile. This engine may be regarded as having exceptional means for steam-saving, but the best engineering authorities in England contend that its performance is no better than that of many good locomotives that are not compounded. The "Gladstone," a well-known engine belonging to the London, Brighton and South Coast Railway, having cylinders 18½ x 26, burns 31 pounds of coal to the mile, while running an express train weighing about 200 tons at a speed of 45 miles an hour. From the record of work done by engines on the Great Northern Railway, I find that a freight engine, with cylinders 18 x 26, pulling a train similar to that handled by the Mogul, already referred to, and over a road whose physical features are nearly the same, does its work with a fuel consumption of 50 pounds to the mile. Many attempts have been made to explain away the unfavorable fuel record our engines make compared with those in Europe of the same size doing similar work, but these well-meaning attempts have not been convincing. If other engines are making a better record than ours, our best way towards equalling or excelling them is to recognize the truth and investigate the cause. Considerable experience with the running of locomotives on both sides of the Atlantic, leads me to believe the allegation, that greater expense is incurred in operating our locomotives than what is found necessary with British engines, to be genuine, and founded on undeniable data.. I shall endeavor to point out some of the causes which I think contribute to this undesirable condition of affairs.

Proper investigation would probably identify several causes as contributing to the unfavorable record of the American locomotive. However good an engine may be, it is not likely to make an economical showing unless the men in charge are interested in bringing about that result. The American locomotive engineer and fireman are second to none following the same calling for intelligence and high character, but they are not trained up in the rigid ideas of fuel economy that prevails among the enginemen of Britain. There are roads here where strict economy is habitually practiced, but they are exceptional. The average fireman on the ordinary run of roads gives no heed to coal-saving, his work being regarded as good so long as he keeps up the required head of steam. Be-

fore firemen can be blamed for this laxity, an examination of the means at their command to promote fuel-saving is necessary. An important item of heat waste is the steam thrown away through the safety-valve. Now, what aid has the fireman received from the locomotive builders and designers in restraining this source of waste? The ordinary ash-pan is made without pretense at being air-tight, and to call its doors dampers is a delusion and a snare. There is also a greater evil in this than the mere loss of heat by steam blowing off. Firemen are prevented from learning the practice of regulating the admission of air to suit the fire, so they fall into the habit of making the fire suit the full admission of air.

Let us suppose that every pound of coal consumed in the fire-box is capable of generating 14,500 units of heat, combustion being effected by the oxygen taken from twelve pounds of air. In this case there would be thirteen pounds of mixed gases heated by the heat liberated from the single pound of coal, elevating the temperature to 4,700 degrees Fahr. But locomotive fire-boxes when the engine is working need a liberal supply of air to effect complete combustion, and eighteen pounds of air to the pound of coal is low for the intense draft of our engines. To heat up nineteen pounds of gas, one pound of coal will not raise the temperature higher than 3,200 degrees Fahr.—a loss of 1,500 degrees below the other, and every additional pound of superfluous air cools the gases of combustion in like proportion.

My object in adverting to this well-known fact is, to allude to its practical effect on our loose methods of controlling air admission. When an engine is working with a heavy fire, more air is needed to penetrate the mass and affect combustion than what is necessary where a light fire is carried. But our practice is to give the same supply for both cases. The consequence is that an engine will not steam with a light fire, because the rush of air is so great through the thin coating of coal that the gases are chilled below the point of ignition. In approaching stations or long descending grades, firemen could often let the fire go light if they could regulate the admission of air by proper dampers as their compeers on British engines are enabled to do. This practice of permitting a free rush of air through locomotive grates at all times is responsible for more waste of fuel and damage to fire-box sheets than is generally recognized.

What appears to be another source of loss with us is the practice of using viciously contracted exhaust nozzles. When we reflect that induction of furnace draft by exhaust steam, is subject to the same laws that regulate the induction of a current of water by the steam jet of an injector, it seems a curious spectacle to see the exhaust steam passed from the pipes through two parallel nozzles neither of which can be central to the lift pipe or stack that the steam must use as an induction pipe. This I conceive to be a violation of the laws controlling induced currents, and its bad effects have to be remedied by resorting to means which entail other disturbing agencies. Any one who has tried to make an injector work when the internal tubes were out of line knows that he had a difficult job to accomplish. An engine with double nozzles is in the same position in regard to draft induction as the injector is in regard to its ability to throw water when the tubes are out of line. The exhaust steam does not go straight up the stack, acting like a piston to form a clean vacuum behind. Its tendency is to strike on the sides of the stack or pipe, breaking its unity, reducing its velocity, and leaving fragments of the volume behind. To overcome this obstacle to free induction, increased speed of exhaust steam is resorted to which is obtained by contracting the nozzles. This increased speed of exhaust steam is rendered necessary to prevent the scattering steam from destroying the vacuum in the smoke-box. This is not a mere hypothesis. It is the teaching of observation and experiment with engines at work.

The single nozzle is almost universally used in Europe. An ordinary engine with cylinders 17×24 inches will steam freely with nozzle five inches diameter, giving an opening of 19.6 square inches. On the elevated railroads of New York, single nozzles are employed, and their standard engine with cylinders 11×16 inches steam freely with a nozzle three inches diameter, or seven square inches area of opening. That cylinder has a cubical capacity of 1,520 inches. Where double nozzles are used their diameter for a cylinder 17×24 inches is about three inches. A cylinder of this size has a cubical capacity of 5,424 inches. So the steam from this large cylinder has to escape through an opening as small as that which induces draft to make steam from a cylinder less than one-third its capacity. The result of this system is that the ordinary locomotive suffers chronically from back pressure in the cylinders due to unduly contracted exhaust orifices.

It may be said that a certain height of smoke-box vacuum must be secured to make an engine steam, no matter what kind of nozzles are employed. But facts do not substantiate that theory. Every one who has tried the two forms of nozzles knows, that steam can be made freely with a much lower vacuum when a single nozzle is employed than in the case of double nozzles. And where a decrease of smoke-box vacuum is practicable a direct saving of fuel is effected through the fire not being torn up so much by the blast. This also permits a steadier fire-box temperature since the current of surplus air is less fluctuating.

The only advantage claimed for the practice of using double nozzles, is that a single opening allows the exhaust steam from one cylinder to shoot over through the junction of the exhaust pipes into the other cylinder, causing more back pressure than contracted nozzles. This defect is due to a wrong pattern of exhaust pipe. Where the pipes are designed so that the steam is flowing in a nearly vertical direction before the junction of the pipes is reached, there is no trouble from it passing over into the other exhaust pipe. Indicator cards taken from the engines on the elevated railroads show no shooting over of the steam, and British locomotives indicate no loss from this source.

The practice very general in Europe of using driving wheels much larger than ours may have some influence on economy of heat. An engine running at a rate of forty-five miles an hour having drivers sixty-six inches diameter, exhausts fifteen times each second; an engine with drivers eighty-four inches diameter running at equal speed exhausts twelve times each second. The effect which the rapid exhausts have upon the fire appears to have received too little attention. When the period between the exhausts is long enough to admit the gases to flow with a pulsating motion, their speed through the flues must decrease between the exhausts. This would permit more of

the heat to be abstracted for evaporation. Those who are in the habit of running engines up steep grades with heavy trains, know that so soon as the engine begins to move slow the generation of steam becomes exceedingly rapid, although the engine may be working up to its highest capacity. Heavy work done under such circumstances is performed very economically, which may be due to the slow exhaust permitting effectual absorption of the heat.

While I stand second to none in admiration of the many excellent qualities of the American locomotive, I think there is a possibility of making it lighter on fuel. In working towards that end the points brought up in this paper may be found worthy of investigation.

RAILWAY COURTESIES TO MINISTERS.

[From the *Railway Age.*]

AT a recent meeting of the Presbyterian clergymen of Pittsburgh the question for discussion was: "Is it expedient that ministers accept special courtesies from railways and business men." The subject seems to have awakened a good deal of interest, and most of the fifteen ministers present gave their views upon it "without militating," as the reporter of the Pittsburgh *Telegraph* remarks, a little wickedly, "in the slightest against their economical summer touring prospects." While some of the speakers seemed to think that somebody else might think that their denunciation of corporate wickedness might be somewhat less muscular and emphatic if they accepted special favors from railways, and one of them thought that if a clergyman had a pass in his pocket the whistle of a Sunday train on that particular road might not be quite as offensive as it otherwise would be, yet it was the general sentiment that no sacrifice of principle, influence or dignity was involved in the acceptance of such favors. It was urged that ministers do a large amount of gratuitous work for the general public for which they receive no compensation. It seemed hardly right to make a clergyman pay his fare going to and coming from a funeral when his time and services were given gratuitously. The notion that railways bestowed courtesies of this kind upon ministers in order to restrain their adverse criticism was strongly repudiated by some of the speakers. It was rather because the corporations recognized the utility of the work done by the clergy and the benefit of religious influences. One gentlemen said that for two years after the adoption of the new constitution, which forbids the issue of passes by the railways which accept its provisions, he had strictly observed this provision of that instrument. He had voted for the constitution and, during that period, had acted consistently with his vote. But when the railways construed that provision in such a way as to permit them to bestow such courtesies, he had abandoned his previous views, acquiesced in the new construction and quietly accepted his passes. While none of those present believed that these courtesies were tendered to ministers to influence their treatment of the railways, yet the idea was advanced that passes were given to politicians "for a purpose." In this the good men seem to have been a little weak, both in logic and charity. The speaker who summed up the discussion thought there was a radical difference between accepting half-fare cards or passes from the railways and taking special discounts for goods purchased, etc., from business men. No duty could be influenced by the latter practice, while in the cases of railway passes the stamina of the preacher *might* be a little weakened. In this, too, the logic seems a little lame. If a minister is in danger of being too lenient to Sunday excursion trains because he has a half-fare pass, will he not moderate his denunciations of the fraud of putting shoddy cloth in garments if he gets a ministerial discount of 25 per cent. from his tailor?

We believe that, with few exceptions, railway managers do not grudge in the least the special favors extended toward the clergy. Where they seem to do so it is because they have been repeatedly and outrageously imposed upon. There are many men, who, by some grave mistake of the ordaining authorities, became entitled to write "Rev." before their names, but who have long ago drifted into other business and only remember that they have been made ministers when they wish to travel. It is the impositions of such as these which, in some cases, have caused the withdrawal of special favors from all clergymen. But the men who, on insufficient salaries and with life-long self denial, are upholding religion and morality in the towns and villages along our railways are usually treated with much liberality by those who manage the roads, and the favors are granted them with entire willingness. It is not in their attitude toward such men nor toward the sick and the destitute that our railway corporations show themselves to be soulless. This fact was spoken of by Rev. Mr. Donehoo, who, in the discussion referred to, said:

> The railroads centering in Pittsburgh do more charity work in proportion to capital than any of the corporations of this State. It would surprise the association if they knew of the sick, maimed and distressed that are carried free, the immense charity transportation that any good cause evokes. The Lake Erie Road carried without charge, all the children that the fresh air fund, last summer, boarded in the country. These corporations must be admitted to be not altogether soulless, and courtesies are not extended to ministers to secure their good will.

It is right that ministers should have sensitive consciences, but they need not fear that there is any bribery in the half-fare cards which they receive from the railways.

A MEXICAN VIEW OF THE PANAMA CANAL.

[From the *Mexican Financier.*]

RENEWED interest in the subject of international communication between the Atlantic and Pacific oceans by means of either ship canals or railways is everywhere being manifested at present. In the United States, Secretary of State Frelinghuysen recently brought the subject of the Nicaragua route before the attention of the Senate, by requesting an appropriation of $250,000 for a further study of the question and for obtaining certain concessions from the government of Nicaragua. Frequent allusions are being made by the press of Boston, New York and other large cities to the three reports on the present state of the De Lesseps canal and its future prospects. These reports, which will soon be issued from the Government Printing Office at Washington, are written, one by Admiral Cooper, commander of the United States fleet on the North Atlantic Station, the other two by Lieutenant Rodgers, of the frigate *Tennessee*, and, from certain ex-

tracts already published in American newspapers, would seem to give a complete and impartial review of the situation.

The progress of the works of the De Lesseps canal and the general situation on the Isthmus of Panama is of great importance to the future commerce of Mexico. Judging from the geographical position of this country, its present spirit of progress, its rapid advancement in political power as a nation, its natural right by reason of its preponderance of population, of extent of territory and resources, to act as leader in the politics of Central America, it is not rash to indulge the belief that this nation will some day absorb Guatemala, Honduras, Nicaragua, Costa Rica, San Salvador and the States of Colombia, forming thus one great and homogenous Spanish-American Union modeled upon that of the United States of America.

Should this ever occur, the operations of the Panama canal would be of most vital importance to Mexico; in fact this country would then, to a certain extent, control the practical workings of the canal. As the situation now exists she is not, and cannot be, an indifferent observer of the progress of Count De Lesseps' pet scheme. The opening of the Panama canal will give to all the Mexican ports upon the Pacific coast, as Acapulco, Colima, San Blas, Guaymas, and Mazatlan, a cheap and speedy transit for their exports of coffee, rubber, minerals, woods, skins and dye stuffs, now sent across the Isthmus of Panama by rail at extortionate rates of freight (in some cases amounting to five cents per pound), and then reloaded on steamers for shipment to various American and European ports, or freighted around the Horn, as is still the case to a limited extent, in sailing vessels.

The ports on the Gulf coast, as Veracruz, Tampico, Tuxpan, Progreso and Campeche. will have opened to them rapid and cheap communication by water with all the many important commercial cities along the coast of Chile, Peru and Bolivia. In proportion as the agricultural interests of Mexico are developed, the demand for guano to fertilize its wheat, corn and tobacco fields will increase, and the guano of Peru will then come directly to us, via the Panama canal, instead of by a circuitous route of many thousand miles.

It is stated by a Panama correspondent, that should the construction of the canal proceed at the same rate of progress as at present and during the past six months, it will require at least twenty-three years to complete it and open to commerce this great waterway. In less than twenty years from now there will surely be direct railway communication from the City of Mexico to the Panama canal, and, by means of lines now building or projected, from the Isthmus of Panama on down the South Pacific coast to Valparaiso, Chile. The Mexican Southern Railway, which is now resting in abeyance because the concessionnaires have not as yet succeeded in raising the necessary capital, will undoubtedly be built in the near future and will open up the State of Oaxaca, the richest mineral district in Mexico. This trunk line will naturally connect with the extensive system of railways now being constructed with great rapidity in Guatemala, and thus in a few years Mexico will be put in direct communication by rail with all Central and a great part of South America, as she now is with all parts of the United States.

No effort of the imagination is required to forecast the great future in reserve for this country as a result of the certain extension of her railway connections, and her consequent political and commercial relations with her neighbors in Central America, whose manifest destiny seems to be that they should become united to Mexico for the formation of one great Spanish-American confederation.

An editorial in the New York *Herald* of June 19, says: "It is of the greatest importance to cultivate commercial relations with Mexico, because it is through that country that the great markets of South America will eventually be most easily reached." So the conviction is spreading that in a few years Mexico will become a great power, holding in its grasp the key to the commerce of the entire American continent.

Corroborative Evidence.

THE contrast drawn in the June issue of the JOURNAL by "An Old Traveler," between the English and American railway systems has provoked considerable comment. *Apropos* of the subject and corroborative of the ground taken by the writer, the *Railway Age* in an editorial note remarks: "A recent letter states that Pullman cars are 'dragged in solitary emptiness in the center of the Scotch Express,' the reason assigned therefor being that they are 'too public.' It was a long struggle to have the cars introduced on two English lines, and perhaps America is behind in her palace car system, but what is to be said of the observations of leading foreigners, who, upon their return to England, have pronounced the system of American passenger railroading the finest in the world. We may add in passing that the English persist in not adopting the convenience of the American system of checking baggage, and who is it that has been abroad who has not witnessed the most miserable confusion at the arrival of every train. Thousands have pronounced the baggage business as absolutely one of the most unpleasant features of travel on the continent."

The Proposed African Railway.

THE London *Telegraph* in speaking of the proposed railway in the Northeast of Africa, remarks that "the inevitable expedition will have to go by the route which nature indicates and man has followed since the days of Cambyses—that is to say, by the Suakim-Berber line, which is the nearest passage between the Red Sea and the Fifth Cataract. Just as certain it is that a railway connecting these points will prove the indispensable adjunct and instrument of the undertaking. The narrow gauge line which we can and must lay would go up with the troops, water, feed and support them, connect them at every hour with the sea and supplies, and continue to exist and to be profitable when the last British soldier had quitted Suakim. Long ago such a line ought to have been constructed. It has been contemplated ever since the early days of Ishmall, and Tewfik would have established it, and Hicks defeated the Mahdi. We ourselves observed, when the discussion first arose about dispatching Gordon, that 'the best possible governor-general for the Soudan would be the Berber-Suakim railway.' Even if Egypt expended the money for its construction, it would prove the wisest outlay she ever made; but, as a part of the cost

of the campaign of relief alone, it would save vast sums, and may be considered, indeed, as a *sine qua non* of the enterprise, and the first and most important business to take in hand, when once the word is uttered that all these people who look to England for succor are not to perish. Of course the railway thus contemplated must be cheap and simple. Experienced contractors affirm that a narrow gauge line can be laid over the easy country in question at the rate of five or six miles a day. The distance is about 280 miles, and allowing for preparations and organization, it could be finished, whatever the weather, in four months. It is estimated to cost £750,000; but then it would be a property, and a very good one, sure to develop commerce and intercourse, and 'smash the Mahdi' by the means most fatal to him. Fifty miles of the metals are lying ready at Woolwich; the ironmasters of the Midlands could supply 100 more at short notice, and the rest could soon be provided. Payment, slender enough in the eyes of the British navy, but dazzling to an Arab, would set the tribes of the desert to work night and day upon the job, and every league completed could be protected by armed trucks and engines, which could be held like Mobile fortresses. Water may be got in quantities by means of tube wells wherever the Arabs find it in driblets, or might be run up and stored in tanks; and all the way to within fifty miles of Berber there are springs; while at Kobreb, on high ground, there is quite a beautiful oasis, fit for a sanitary station. Moving up by this swiftly built line—which would have no great elevations to climb, and no serious hollows to bridge—the column of rescue would arrive at Berber, probably with little or no fighting, for even the fiercest tribes would know the Mahdi's reign to be over when the railway echoed from Mount Erkoweet."

The Block System in England.

ABOUT ninety-four per cent. of the double mileage of the railways in England and Wales is now worked on the absolute block system, and the greater portion of the single lines is under the same control, in addition to the train-staff system. In Scotland the double mileage worked by the absolute block is ninety per cent. of the whole, and in Ireland twenty-two per cent.

American Locomotives in New Zealand.

A CORRESPONDENT of the Chicago *Tribune* writing from New Zealand, thus speaks of its railways: "As in other colonies, the railways here are the property of the government. I hear of one exception in the south end of the North island, where a short line is being built by a company of private capitalists. It is whispered as an open secret that the builders of the line have the pipes laid for selling it to the government when completed, at a handsome advance on its first cost. All the railways I have seen in New Zealand are narrow gauge. Passenger and other cars are built here, while the great majority of locomotives are from England, the small remainder from the United States. While in Dunedin I noticed a handsome engine standing at the depot bearing the imprint of "Baldwin Locomotive Works, Philadelphia, U. S. A." The engineer, in reply to my inquiry, said that master mechanics and engine drivers liked the "Yankee" engines better than English built ones, but the railway officials who did the buying insisted on sending "home" for their purchases. Another Yankee innovation found at Dunedin—on the forty-sixth parallel of south latitude—attracts special attention. A cable railway a mile long through one of the principal streets, and up a grade that would be impracticable for horses or traction engines, claims and secures tribute to American genius from thousands of daily patrons.

Does the Piston Stop at the End of the Stroke?

PROFESSOR DE VOLSON WOOD, in a communication to *Science*, in which he points out that there is the same difficulty in the fundamental conception of the method of limits as of the infinitesimal method in calculus, says in support of his position: "A student learns to repeat with ease, 'Velocity is rate of motion,' and thinks he understands it; but I have had many such ask, 'In a mathematically perfect engine, does the piston stop at the end of the stroke?' 'Does it remain at rest any time?' 'How can it reverse its motion, if it does not stop?' 'How can it cease going in one direction, and move in the opposite direction, without stopping between the two motions?' These are critical questions, lying at the very foundation of all change of motion. Does change in the rate of motion take place *at* an instant, or *during* an instant?"

A Significant Circular.

THERE is much significance in the following circular issued by a Western railway and addressed to its conductors. There has evidently been a "leakage" somewhere, and the demand for reform is most imperative. Probably the circular would be of interest to the managers and conductors of other roads for whose benefit we give it in full:

"Notwithstanding the explicit instruction given on certain points enumerated below, there has been a laxity in the observance of same that must be corrected; to wit:

1st. Punching tickets when first presented and in presence of passengers. This rule is by no means fully carried out. Many conductors—passenger as well as freight—make their collections without canceling, and punch tickets subsequently, when convenient. This deviation *will not be permitted* hereafter, in any case, and a full compliance with this rule is insisted upon.

2d. Collection of train rates. The tariffs and instructions plainly notify conductors what rates are to be collected on trains, yet it is known that many deviations are made therefrom, and the reports bear a number of undesirable notations, giving such excuses as "*charity*," "*all I got*," "*late for train*," "*all he had*" "*broke*," "*had ticket to* ——," etc., etc. These excuses are not acceptable, and show no persistent effort on the part of the conductors to enforce the rules. If *all* conductors would *earnestly* and *faithfully* carry out their instructions, the collection of *full* train rates would be found a comparatively easy matter. Then passengers would not expect anything else, and would naturally anticipate complying with the company's regulations; but when a *part* of the conductors are lax in this respect, and only a part strict, *a sure foundation for trouble*, annoyance and demoralization is prepared for all concerned, and it becomes difficult and unpleasant to enforce the rules. Therefore, this serious evil *must be remedied in the future*.

3d. Cash fare slips. This system has been in use for more than a year, and thus far it has been but imperfectly carried out upon the part of many conductors. *The management is in earnest* in exacting full compliance with all the rules governing the use of these slips, and has only through leniency delayed giving final caution to those who are derelict in this matter. *Hereafter a "new departure" will be taken*, and each and every conductor must understand that he is to carry out his instructions in this matter to the letter, and without deviation.

The rigid enforcement of the foregoing rules is of the first importance, and no excuse will be accepted for a non-compliance therewith.

In conclusion, the management does not by any means intend to censure

its conductors by the wholesale, nor need any conductor who does his entire duty feel that these admonitions are addressed to him; but as the neglect of *some* inevitably affects the whole, and for the encouragement of the conductor whose faithful performance of duties is known and appreciated, we cannot do less than to warn those who have in any way been remiss in the past, that *hereafter they will be held responsible* to a strict performance of the particular duties herein referred to, as well as of those otherwise prescribed."

Electric Headlights on Locomotives.

AN electric headlight is highly desirable. The lamented Du Moncel said "In the tests made on the Northern Railway (of France) the luminous rays permit of distinguishing buildings, bridges, etc., at 400 and 500 meters (1,312 and 1,640 feet), the visibility of signals is not altered, and the train thus signalled can be seen at more than 1,500 meters (4,921 feet). It is easy to understand, after these results, how much a similar system could add to the safety of night journeys, since the train itself will always signal its presence at a distance more than sufficient for those coming to meet it, or following too close, to stop in time. In cloudy weather the signal, reflected by the clouds, could be perceived still further off, and one could, even by eclipses arranged on a code, send signals which could be as well understood as a telegraphic dispatch. These signals, besides, could be produced equally well without such reflection, and could be simplified by the interposition of colored glass disks." It is certain that the ability assured an engine driver to light up the track to a distance greater than that necessary to use the power brake, contribute in itself an advantage not to be overlooked.

In Austria a recent ministerial degree prescribed this mode of lighting on all trunk lines and recommended it for all lines. In France, it seems that the electric headlight would blind the employés at the stations, and the public feared false switches, etc., and all sorts of accidents.

When.

WHEN the gauge of the Southern railroads conforms to that of the other railroads of the country the last vestige of provincialism in that great section will be swept away. The Ohio river may seem a barrier, but the bridge at Cincinnati, and those soon to be completed at Henderson and Cairo, will triumphantly overcome the obstacle, and railroad trains will be run solid from one end of the land to the other.

When the South has more cotton mills and foundries; when the coal and iron is utilized by steel-rail mills and iron works; when the forests are being turned into articles of export, implements and tools; when the great sugar districts are all brought under thorough cultivation; when corn and wheat are alternated with cotton, and clover restores the tired soil; when new railroad lines are made necessary to accommodate the increased volume of traffic; when gardens and vineyards deck the plain and ornament the valleys; when the pastures of the Blue Ridge are dotted with herds and flocks, and when new cities spring into existence in the Southeast; then will the world understand what a glorious prosperity and wealth is the heritage of the South, and will soon be possessed by it.

And its railroads will be joint participants in the gains that will reward the workers.—*Railway Register*.

New Telegraph Cables Between Europe and America.

A NEW cable has been laid between Ireland and Nova Scotia, thence to this country, by Messrs. Bennett and Mackay. The cable used in the present enterprise is undoubtedly the best that has ever been made, representing the accumulated experience gained in the construction of all previous ocean cables. It was manufactured by the Messrs. Siemens, at their works near London. Upward of 2,500 men are employed in the establishment, and 1,700 of these were employed on the present cables, for there are two of them, which extend side by side from Ireland to Nova Scotia, whence one goes to Rockport, Mass., and the other round Cape Cod to Fire Island, N. Y., and thence to New York. The aggregate length of the two is over six thousand miles. The shore ends are two and one-half inches in diameter, while the cable proper is but one inch in diameter. The conductor is formed of thirteen wires, consisting of twelve small wires coiled around a central wire one-tenth of an inch in diameter. The insulating material is gutta-percha, between which and the armor there is a cushion of jute. The first message despatched over the cable was successfully sent a day or two ago from Paris to Mr. Mackay at Rockport.

Cost of the Suez Canal to England.

A PARLIAMENTARY paper shows that the total cost to England of the Suez Canal shares (including £98,414 paid as commission to Messrs. N. de Rothschild & Sons), was £4,076,622. The Khedive has since paid yearly £198, 829 2s. (being interest at the rate of five per cent. per annum on the actual purchase money in consideration of the deferment of the right to receive dividends on such shares), and it is estimated that the amount of debt on the transaction remaining unredeemed is £3,455,406.

THE contract of the Pennsylvania Railroad Company with the Pullman Palace Car Company expires in January next. In the meantime the former company is building some experimental palace cars at its Altoona shops, to take the place of those that will be discarded with the expiration of the Pullman contract provided a renewal of the contract is not satisfactorily made. While the Pullman company may lose by the expiration of some of its old contracts, it is gaining in the completion of new. It recently entered into a fifteen years' agreement with the Canadian Department of Railways for service on the Intercolonial Railway, and it is stated that the present agreement with the Grand Trunk Railway, which ends in August next, will be extended for a further term of five years.

A RETURN has been issued of accidents and casualties reported to the Board of Trade by the railway companies of the United Kingdom during the year 1883. From this it appears that during the year 1,230 persons were killed, and 8,123 injured. The classification of the accidents shows that 11 passengers and 11 railway servants were killed, and 662 passengers and 87 railway servants injured by accidents to trains, rolling-stock, and permanent way; while 114 passengers and 543 railway servants were killed and 754 passengers and 2,373 servants were injured by accidents from other causes.

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TO OUR READERS.

IN our endeavors to conduct the AMERICAN RAILROAD JOURNAL as a monthly railway magazine and review, we cordially invite contributions to its columns. Whether they treat of railways or tramways, management, construction or inventions, whether they be mechanical, narrative, legal, or discursive in their nature, they will be equally acceptable, provided they are well-written and of conspicuous interest to our readers. Nor do we ask that such contributions shall be gratuitous. The laborer is worthy of his hire, and for all accepted articles we shall pay a fair sum upon their publication. Every communication sent us with a view to publication, will be carefully examined and if deemed suitable, accepted. If unavailable for our purpose it will be returned upon receipt of postage. Let every reader of the JOURNAL consider these words as addressed to him personally, no matter what may be his occupation, and out of the fulness of his wisdom or experience, let him essay to contribute a readable and valuable communication to our columns, with the assurance that his efforts will not be unrewarded and that he will have benefitted the industry with which he is connected.

PORTABLE RAILWAYS.

AN interesting feauture of the proposed British military expedition for the relief of General GORDON in the East, was a "flying railway" for the transportation of troops and supplies. The construction of the road was to be as light as was consistent with safety, and it was expected to complete the railway within three weeks after effecting a landing of the material. As prepared for shipment, the proportions of the material are given, with the rails 21 feet in length and weighing 26 pounds to the yard; the sleepers formed of ¼ inch iron plates with an "M" section, 6 inches wide by 3 feet long; and the engines of 15 or 20 horse power with a drawing capacity of about 40 tons. The guage of the road was to be remarkably narrow, the rails being but 18 inches apart and attached to the sleepers by a grip.

The fall of Khartoum will in all probability modify the arrangements of the proposed expedition, and the flying railway will not be taken to the East. We will regret the omission of this feature for its success would open up a new field in railway experiments, and if thoroughly successful the feasibility of portable railways would receive much attention. Without doubt such an undertaking could be accomplished, for the obstacles are technical and would disappear after a careful study given the problem. To some extent portable railways are now in operation, but they are primitive affairs and their portability is only approximate; they may be called portable because they are not of permanent construction and were

laid for temporary use, but they lack the characteristic compactness and mobility which are the distinguishing features of anything portable. The ideal portable railway should consist of a jointed track with the rails and sleepers already attached, requiring but the laying and leveling to prepare it for immediate operation. The tedious clamping of the rails to the cross-ties should be obviated in laying the track, and all work of this sort should be incorporated in the material. The track should consist of sections of equal length, each section composed of two parallel rails connected by attached sleepers, and a simple mechanism should be devised by means of which the various sections could be joined and imbedded in the soil and form the completed road. Provision should also be made for curves, and sections of curved track should accompany the outfit of the road, together with sections on which turn-outs and switches could be rapidly constructed. The engines should be light and compact, and the cars constructed so that they may be taken apart and packed in the smallest possible compass. Such would be the perfect portable railway, and as yet we have to hear of one in practical use. No railway mechanic would say that the construction of such a road was impossible, but it presents obstacles that would require much study to overcome. There would be much difficulty for instance in devising a satisfactory means for preparing the track in sections, and probably more in perfecting arrangements for joining these sections and firmly imbedding them in the soil; but in comparison with many railway problems that have been correctly solved, such achievements would be of the merest detail. The portable railway is an absolute possibility and its uses would be manifold.

Doubtless the laying of a portable railway would be impossible in hilly and mountainous country, and it could not be of very great length under any circumstances. From the rapid, "ready-made" nature of its construction but a very low rate of speed could be maintained, and there are strong possibilities of the displacement of the rails and depressions of the road-bed; but nevertheless a portable railway could be constructed that might prove of incalculable benefit to exploring and engineering parties, and far in advance of anything heretofore attempted. The demand would be slight for such a road, but the time would come when it would be indispensable and the inventor might reap a handsome profit.

FRANCE has formally presented the Bartholdi statue to the United States, and the gift has been properly acknowledged by Mr. MORTON, our resident minister. Its arrival in New York is soon expected, and the work of erecting it upon Bedloe's Island will quickly ensue. In this country we have been very stingy in contributing funds for the pedestal, and our treatment of the intended gift has been decidedly ungracious. A contemptible feeling has been manifested that in the presentation of a munificent gift, France was "putting up a job" on us instead of showing us a generous and hearty courtesy; and the press is not wholly blameless in propagating this base and groundless suspicion. But now that the statue is on its way, little difficulty may be anticipated in raising funds. People are slow to subscribe for any project whose consummation is a contingency of the remote future, and for this reason probably, there has been difficulty in the past. When the statue is landed on our shores, and the collection of a hundred thousand dollars is all that stands in the way of its erection, the pockets of public-spirited citizens will open quickly enough, and a very few days will see the necessary amount subscribed.

NEWSPAPER CHEEK.

WE are in receipt of a communication from a lawyer in this city, requesting us to become parties to a "test case" in which the publishers of periodical papers are supposed to be deeply interested. The first point to be "tested" is the following:

"Whether a publisher can send a paper without any order at all and then collect on the ground that the paper had been taken from the office."

We read as far as this and it was enough. It is unfortunate for the journalistic world that it should be infested with persons whose energies are directed toward devising means to outwit the public, but such is the case, and the above proposition is an outgrowth of a desire on the part of publishers to increase their circulation by forcing the public to subscribe for their sheets. It is an old point, and it has been raised a score of times. There is even a law to that effect, but like all laws established through demagogism and the fear of the press, it is a miserably ineffective institution. We will apply the law to other industries and see the pass to which we arrive. Let us assume that grocers should demand a similar law (and in sober justice they are equally entitled to it), and that the principle involved should be extended to cover their business. All Mr. Jones, the grocer, has to do to "boom" his business and handle the sweet fruits of his industry, is to do up several thousand packages of flour, sugar, rice, or any of his wares, and by means of a city directory, upon each package write the name and address of some worthy and inoffensive citizen. These packages will then be delivered by wagons, and the unsuspecting domestics of the aforesaid citizens, seeing their employers' names upon the parcels, will of course deem it correct to receive them. That settles it. Mr. Jones immediately sends out his bills, and no matter how inferior the goods nor excessive the charges, he has the law on his side and can collect the amounts, because the goods were received. He will

not even accept a return of the goods in place of payment, because a law has been passed which enables him to force his wares upon whomsoever he pleases. He need not even go to the expense of employing useful commodities in his ingenuous traffic, for this most convenient law does not require him to consider the wants of his victims. He may deliver mouldy cheese at $5 per pound if he chooses, and rotten eggs at $12 per dozen. All this makes no difference; when the closely tied package with its hidden contents is once accepted, the bargain is indissolubly sealed.

Of course if such privileges were extended to grocers, they would also be claimed by butchers, and by bakers and candle-stick makers, and in a short time the law would be universally applied. Where would the public be then and what safeguards would they possess from being overrun with articles of every description for which they could not find the slightest use? With what virtuous indignation would the press assail such a law, and how loudly would a publisher protest in case his grocer should play the trick on him! But, Mr. Publisher, where would be your consistency? You claim the right of forcing your paper upon any person you may select, regardless of his wishes, and yet you complain if your grocer exercises the same right upon you. You may say that the person to whom your paper is addressed need not take it out of the post-office. But neither need your servant receive the groceries. You may say that the package of groceries bears your name and address and that your servant does not know its contents and fairly presumes that it was ordered by you. But your newspaper bears the name and address of the person to whom it was sent, and is ordinarily concealed by a wrapper; how is he to know but that it is sent him in good faith by an acquaintance or by some publisher of whom he *has* ordered a paper? You may say that you cannot possibly find use for the groceries. But it is quite as likely that the person to whom you sent your paper can find neither pleasure nor profit therein. You say that you are willing to return the groceries untouched save that the package has been opened. But the recipient of your paper is willing to return it in perfect condition save that it has been taken out of the post-office and the wrapper removed. You say finally, that publishers as a class possess political influence, while grocers do not. Ah! at last you have struck it! So because you can bully some legislative pigmy and wield an influence which may elect or defeat him at your pleasure, you belong to a favored class for whom special high-handed legislation is to be furnished. That is the ground upon which you stand when you say that what is sauce for the publisher is not sauce for the grocer.

The law which provides that publishers may mail their publications broadcast, and collect payment upon the ground that persons have received and opened mailed packets bearing their names and addresses, is a legal absurdity and its exercise a piece of unparalled impertinence. A thousand such laws may be passed and we firmly believe that not one would stand the test of constitutionality.

So far as this kind provision of the postal laws applies to the JOURNAL, we take this occasion to repudiate it. We may send sample copies to various individuals, and we cordially hope they will feel inclined to subscribe; but if they do not, we recognize no claim upon them for the amount of the subscription nor will we endeavor to collect it if they take the paper from the post-office. We might, if we chose, continue to send the JOURNAL to them for a year or more, but that is our lookout, and until they order it sent we would urge no claim.

It is hardly necessary to say that we decline with thanks to become a party to the interesting suit before mentioned. It is true that there are a few more nice points that are to be tested, and one is so particularly refreshing in its bland simplicity that we quote it for the admiration of our readers:

"Whether in case a person does not want a paper and orders it stopped, but by some omission it is still sent and is taken from the office, there can be a recovery."

This and more to a similar effect will make up the test case which is to be taken to the Court of Appeals. There are two or three points in the proposed case which are worthy of consideration, but accompanied with such flagrant items as the above their merits are forgotten. We regret to see that the names of a number of leading journals appear upon the list as having agreed to enter the suit and urge a favorable ruling on the astounding points we have enumerated. It is not to their credit, and for their own sake as well as for that of all respectable journals, we trust the case will be defeated in the courts. Were these provisions to be established as law the only effect would be to injure the publications. No persons in their right minds would think of taking a strange paper from the post-office, and the employment of specimen copies as a means of extending circulation would cease to have the slightest effect.

THERE is scarcely a chance that this country will escape a visitation of the cholera with its attendant horrors, and the sooner we put ourselves on the defensive the better. As remarked by the eminent German authority, Dr. KOCH, with such centers as Marseilles and Toulon, the cholera must spread everywhere, and its arrival in America is probably but the question of a few days. If the disease once gains foothold in this city, teeming with a foreign population and subject to constant immigration from every quarter of the globe, its dissemination throughout the States will largely be effected by means of the various railways. While the latter are powerless to

avert the calamity they should not neglect a single precaution in mitigating the chances of a wide-spread epidemic, and the observance on their part of a few simple sanitary rules, might be of the greatest benefit. Their cars should be thoroughly ventilated and cleaned, and especial attention given the closets, which should constantly be treated with powerful disinfectants. Railway stations should be similarly purified, and railway employés instructed in those sanitary and hygienic rules which experience has taught is the only weapon with which cholera may be successfully confronted.

THE MISSION OF RAILWAYS.

IT may be regarded as a settled truth that the great object of all railway construction is to make money for the promoters and stockholders. All pretense to any other object would seem ridiculous, and if there were no distinction between the mission and the object of railways, our remarks would conclude with the initial sentence. But to make money all enterprises must do something—they must accomplish some ends, and these ends are very different from the mere object of money-making. They are the missions of the enterprises, and it remains to determine what are the precise ends accomplished by railways, and what should be the chief end for which they strive.

In general it may be said that the mission of railways is to afford means of travel and communication. That is a safe assumption, but it is open to dispute whether this end is best accomplished by regarding the present or the future. Not only must railways be built to provide means of inter-travel between towns and districts already populated, but there is a further and possibly a higher mission for them in the development of territory. There are vast tracts of land in every large country which are uninhabited simply because there is no railway accommodation in the region round about. Railways are not constructed in these regions because the regions are uninhabited, and thus there is a deadlock between population and railway enterprise. Each is waiting for the other to move. It is for railway capitalists to consider the situation; for no matter what their power and resources, from the nature of things they must take the first step in breaking the deadlock. Let railways be constructed and a population will follow fast enough. The West has been built up and populated through the enterprising construction of railways in fertile and convenient sections of country, and there is much room yet for the further encouragement of colonization in more remote yet desirable portions. It is without question very pleasing for the railway capitalist to feel that the moment a railway is put into operation there will be an enormous patronage from the towns along the line, and it may be very unpleasing to feel that years must elapse before the travel upon some railway through a wilderness will pay the cost of maintenance, but shrewd heads look beyond this. It is the mission of railways to develop the vast wilderness; and by affording means of travel to prospective residents, the latter will come of their own accord. Let a railway capitalist be also an extensive landowner, possessing thousands of fertile yet uncultivated acres in some remote territory, and he is quick to recognize the fact that railways are not only the legitimate outgrowth of population, but that population is also the legitimate outgrowth of railways. In the latter case the profits of a railway are chiefly an outcome of the future, but they increase rapidly when once started, and the wise and far-seeing man is content to wait, For evident reasons landowners are the most enterprising of railway promoters, and to that extent the accumulation of vast landed property which is so feared and decried by Mr. HENRY GEORGE and his disciples, is of incalculable benefit to nations possessing a large territory.

Not only is it the mission of railways to begin the work of development but also to maintain it and grow apace, taking care to be even a little in advance of it. It will not do for a railway to be scant with its train accommodation, promising to increase it when the travel will warrant it. To maintain and increase the work of development the train accommodation should be slightly in advance of the requirements of the towns and settlements on the line, and if this policy is entered into and continued the railways will find that the development of the territory will quicken accordingly. It should be borne in mind that railways possess an enormous initial power—more probably than any other factor of the times in which we live. It is for them and for them alone to overcome the inertia of territory, and failure is almost impossible. There is scarcely a man that cannot call to mind some town possessing every advantage save one, and that one is indispensable. The town may have a dozen railways running through it and it may be but a trifling distance from some important business center; but if train accommodation is lacking, if the latent growing capacities of the town are neglected and but a scanty train accommodation offered because the present travel does not warrant more, the growth of the town is stunted.

Let us assume that a body of capitalists are desirous of constructing a railway through sections of the country in which they have a landed interest. It is their intention to build up and devevelop the towns and villages in the neighborhood, and also to plant the seeds of new settlements whose futures may be great. Let them construct the road and let them for the moment fancy themselves men of modest means anxious to find homes in the vicinity. Better still, let them take up their residences in the locality and be in the same boat with the settlers upon

whom they depend for the development of their land and the profit of their railway. We venture to assert that there would be a wonderful increase in the accommodation offered the traveling public in that region and also a wonderful increase in the growth of its towns and settlements. There is a good deal of wholesome efficacy in the old saying, "put yourself in his place."

The field of future railway construction in this country is immense, and this in the face of the fact that many railroads are to-day hopelessly insolvent; but the insolvency of railways is the outcome of recklessness and not of progress, and that this is the case is evidently proved by the readiness with which capital embarks in a judicious railway enterprise. Domestic and foreign gold is seeking for investment in American railways and in the year past, nearly 7,000 additional miles of railway were constructed, making a total railway mileage of 120,000 in the United States. Estimating our population at 60,000,000, which is a liberal estimate, we find that there is 1 mile of railway to every 500 souls, and thus may be realized the wonderful influence which railways exert upon the prosperity of the country. While destined to fill the purses of their owners, they have a higher end to accomplish, and the better this accomplishment, the more liberal the profits. Bearing this fact in view, it is not likely that the railway capitalists will overlook the mission of their roads, and while it has not received the attention it has deserved in the past, the growth and resources of the country are bringing it rapidly to the fore, and the future construction of railways will in all probability lose its speculative features, and become wisely digested enterprise designed to reap pecuniary profit by serving useful ends in developing the strength of the country and contributing to the prosperity of her people.

THE Brooklyn Bridge has been in full operation for nearly a year, and yet according to the report of the trustees, its receipts fall below its expenses of management. An exchange broadly hints that the bridge is being managed in the interests of the ferry company and in support of the conveyed assertion, mentions the fact that during the absence of the president of the Bridge trustees in Europe, a trustee of the ferry company performed his duties. It is further urged that the Bridge and ferry rates are the same for both vehicles and passengers, the ferries charging but one cent for passengers in the morning and evening hours. We cannot perceive the logic by which the conclusions are reached. If the Bridge cannot be made to pay with rates no higher than those charged by the ferries, little good could be accomplished by a reduction of the tolls, and still less by an increase. The Bridge is a public institution, and the cities of New York and Brooklyn can well afford a tax for its maintenance. It will be controlled for the public good, and there is not the slightest fear that the ferry company will ever be allowed to manage it to their profit. Why indeed should they wish to manage it when its expenses of maintenance are in excess of its receipts? Certainly not from motives of philanthropy.

* * *

THE presidential candidates of both political parties have entered the race, and from now until November a lively time may be expected. While possessing individual preferences, as become good citizens, we hold to the opinion that publications like the JOURNAL, with special fields and missions, should let politics severely alone, and our course of action will be undisturbed by the agonizing warfare of a presidential campaign. One thing we do believe, however; we believe that the country is strong enough to stand and hold its own no matter who is in power, and all talk about the country going to the devil in event of this one or that one being elected is sheer nonsense.

Hints for Sanitary Engineers.

[COMMUNICATED.]

To the Editor of the American Railroad Journal:

DEAR SIR:—The writer stepped over to see one of his neighbors, some time since—an engineer of the sanitary persuasion—and found him rather gloomy and dejected. "Why thus?" was the natural and emotional inquiry which his appearance suggested. "Why thus?" he said, "it is much worse than 'why thus;' I am packing up to leave. My business has led me to believe that civilization is dangerous and is antagonistic to life. I can see that death is cavorting around, on his pale nag, with an improved mowing-machine. In the first place, to make a schedule of all of the ways furnished now-a-days, to help a person out of this life, would be a hopeless task. I have read of late in the papers, of so many ways of adulterating food, that I believe the mania for slow poisoning is revived. No one in particular, wants to poison anyone in particular, but everyone seems to be willing to put anything into anybody else's stomjack; if he can place a percentage into his own pocket by doing so. Then the pharmacopolist is about as mean as the provision dealer, and the doctor comes in, tries to find out what is the matter, and puzzles over it, until the undertaker enlightens him, and ties a black pennant to the door-knob to inform the neighborhood also. Then as to my calling, and that of the plumber, we can beat them all. My profession is of vast importance to the community, but we have to cope with ignorance and stupidity combined with cupidity. These three substances (as the chemist would say), are held by a powerful affinity. It is a combination that has to be broken up.

"I am afraid," he continued, "that I cannot maintain my position. There is a diversity of opinion respecting the different systems of drainage. I have committed myself to the one, which is the best, but has the least 'money into it' for the councilmen, and there is where the shoe pinches my foot, and is raising a corn almost as big as a hay stack."

He began to explain things more in detail. "You see," said he, "there is no trouble with a large sewer; all of the surface water goes into it and you get rid of it (the stuff) at once, and your streets are not torn up, and cut into canyons, and gulches, and every time it rains your sewer is cleaned out. It costs more money at first, but in the end is cheaper than the other plan, for in addition to the cost per foot of the small sewer, there are patent things with it which don't count at first. They flush it, they say, of course, when they are flush of water, but it is not always attended to even when they are. The public functionary is not infallible any more than a savings bank director, or president. And if the darned pipe gets choked up, they have a pill about the size of your head, which they chuck into it, and undertake that system of purgation, which was so popular when calomel and jalop and blood-letting were so fashionable. I really wish you would look into this thing a little, and write it up; it needs ventilation. I am a poor writer myself, but I think that with all of the facts presented, your ready pen could do a great service to us sanitary engineers, and the public. In fact, I would hardly dare to do it myself if I could, for the owners of the patents are making lots of money, and they and the council 'in cohoots with them,' would ruin me."

He reached over from his chair, and taking some books and plans from a shelf, handed them to me, urging me to comply with his request.

Reluctantly the writer suggested that he felt entirely unfitted for the task; it was a new field of thought for him, but still, from the earnestness of the appeal he consented and after several weeks of patient study and reward, has come to the conclusion that all the systems are bad. If there are bacteria in the one they will be found in the other also. Wherever there is a stink there the bacteria will love to linger and dwell. And the more one studies and investigates, the more positive he will be that the more speedily a bad smell can be disposed of, the sooner peace and prosperity will prevail and also good health with it.

A better system, then, would be for each inhabitant of the town to provide himself with a bucket and carry his own private sewage to the river and cast it in. This would be otherwise beneficial. It would afford a wholesome exercise to many people who do not have enough of it as things are managed at present. Persons living at a long distance from the river, might find this to be at times troublesome, and persons in affluent circumstances would quite likely object occasionally, but if satisfied that upon stated days they would be privileged to shoot a large capsule of sewage into the river from the tops of their houses by means of a mortar, they would probably not object to the annoyance which their less fortunate neighbors would suffer.

These projectiles unlike the pills of the small sewage system, could always be seen in their aerial flight describing their beautiful trajectories, and if made of material suitable for the purpose, there would he no danger of their bursting in air, and yet their strength could be so graduated that they would do so upon striking the surface of the water. A reasonable amount of experiment would no doubt give satisfactory results, and no one would be so unreasonable as to complain about the temporary annoyance of any accidents which might occur during the development of the system, as the lasting blessings to be conferred upon society would so far transcend the obnoxious use of sewers as they obtain at present.

Of course this plan would injure the Major (the sanitary engineer), very much, but he is as good as ruined already. He avers that he is not a plumber and does not want to be. He has no faith in the ventilators or the cisterns, or in the pills—thinks the last will not operate, as their action is simply mechanical and not at all similar to that of the article usually prescribed and sold as such. Worse than all, should the "silent perambulator" encounter an obstacle of an obdurate nature, the diameter of which added to its own would exceed the diameter of the pipe, how are you to determine, dear readers and dear hearers, where to locate it. You can't shove a pole the whole length of the street into the pipe, and it will make the taxpayer obnoxious at the next election to tear the whole length of the street up. The large sewer is open to the objection just in proportion to its largeness. Therefore, there can be but little doubt but that the plan proposed would meet with general favor.

I. PONTIFEX, S. I.

P. S.—S. I. does not mean Sivil Ingineer but simply Staten Island. I have submitted the above to the Major. Upon the whole it is satisfactory to him but he thinks I have borne down too hard upon the large sewer, and touched lightly upon the defects of the small sewer system. However, I wrote from my own convictions and not his. He is in favor of my system, however, as it will involve military as well as sanitary engineering.

I. P., S. I.

A Freight Car's Capacity.

"A FREIGHT car doesn't appear to be a big thing, but you have no idea what it will hold until you come to crowd it once," remarked a passenger, as we passed a "boarding car" for track hands. "I'll tell you what I saw once out in Nebraska. At a station called Sutton, on the extension of the Burlington road, the whole town for about a month was one freight car. Yes, sir, just one freight car run out on a couple of old rails by the side of the track. It contained the freight office, ticket office, telegraph office, waiting room, express office, postoffice, and a real estate office, a grocery with a wet goods attachment, a small stock of dry goods, and the agricultural implement man had his stock scattered all around, and his office in the car. The railroad agent's family lived in the car, too, and his wife took in boarders. Nor that ain't all. The last day I was there I saw a sign on that car, 'Furnished Rooms to Rent,' but I afterward learned that meant a bunk in the tent on the roof. I wouldn't exaggerate about this freight car just to squeeze in a little joke like that."—*Exchange.*

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

TRACTION OR PROPULSION.

THE motive power of tram-cars is at present furnished either by horse or cable traction. Steam has been used with varying success and would doubtless appeal favorably to tramway managers were not its use impracticable on crowded streets and thoroughfares. While in the future electricity is, in our opinion, destined to be the motive power of tramways as it will be of every description of railway conveyance, vessel or machinery, for some years at least, other methods must be employed, and their consideration and adoption is a question of absorbing interest to the public as well as to tramway officials.

For some time past there has been a manifest "boom" in favor of cable traction, and alive to the spirit of the times the AMERICAN RAILROAD JOURNAL has devoted much space to the discussion of the subject and is now publishing a series of illustrated articles explanatory of the *modus operandi* of a successful cable road in San Francisco. Cable traction possesses many features that recommend it with favor, and objections to it on the ground of expense are not tenable. In all undertakings there is expense, and this expense is of two kinds—expense of construction and expense of maintenance. The one ceases when the undertaking is ready for action while the other is constant, and generally cumulative. It is possible to reduce one of these expenses to a minimum, and it is safe to assume that the expense of maintenance is, as a rule, the most burdensome in the long run. The initial cost of a cable road is doubtless very large, but when once completed, the running expenses of the road are comparatively light. The advantages of a cable road are numerous and they have been presented in the JOURNAL at a length which renders their discussion unnecessary at present. Over the primitive horse-power road the cable tramway is in every way superior save in the matter of adaptability. It is far easier to obtain a franchise and a right of way for a contemplated horse-power road than for a cable road, and to this extent the advocates of horse-power, if there be any, possess a vital advantage. Beyond this there is little to be said on their side.

It seems strange, however, that while much study has been given to the subject of tramway *traction*, very little has been expended upon tramway *propulsion*. It is ap-

parently a settled conviction that tram-cars must be *pulled* not *propelled*, but no grounds exist for this wholesale discrimination. The distinction between traction and propulsion is clearly marked, but we fail to see that one is superior to the other in affording a motive power to tramways. That traction is regarded the superior is attributable to the fact that the energies of inventors and engineers have been bent in the direction of perfecting methods of traction, while the question of propulsion has been much neglected. Were each given a fair chance it is quite likely that some form of propulsion could be adapted to tram-cars that would prove most satisfactory.

In propulsion, there are general advantages. The power is carried by the vehicle itself. The mechanism is directly under the control of one man, and there is less liability of accident. A steam dummy is a fair example of propulsion as a motive power of tram-cars, and as we before stated, were it not for the impracticability of employing them in public streets, they would be widely adopted. Recently we described a spring motor employed upon a tram-car in Philadelphia, and here the inventor might take a hint for research in the fields of propulsion. Correspondents have written us for information regarding the success of the spring-motor, and we hope to investigate it thoroughly. Still another method of propulsion offers itself in the employment of gas and caloric engines, which, though having the same objectionable features as steam, possess them to a far less degree and might be so adapted to the purpose in question as to remove them altogether. Certainly the question of tramway propulsion has not received the attention it merits, and while not arguing against traction as a motive power, we would suggest that propulsion receive its due share of study in the inventive minds of tramway mechanics and engineers.

MORE ABOUT CROSS-TOWN TRAMWAYS.

IT is gratifying to note that the question which was broached in the June JOURNAL, of cross-town tramways in the lower part of New York City is being vigorously pushed. The *Scientific American* has entered the lists and urges an increased facility of inter-ferry travel, using almost the same arguments we adduced last month. But most gratifying of all is the fact that the Fulton and Cortlandt Street Ferry Railroad Company have applied to the New York Board of Aldermen for permission to lay the tracks of their proposed route. This tramway is intended to run from the Cortlandt street ferry, through Cortlandt street, Maiden lane, Burling slip and South street to the Fulton ferry, and thence returning through Fulton, Washington, Dey and West streets back to the Cortlandt street ferry.

The merchants doing business along the proposed route have objected to the laying of tracks in their streets, but we think they are not consulting their best interests in so doing. Though they may suffer some little inconvenience, the tramway would be of great benefit to their business and supply a want that has long been felt in the metropolis. The chief objection in granting the petition seems to us to be the question of crossing Broadway which the company propose to do at two separate points and on a level. With this fact in view the Aldermen should think twice before they accord the desired permission.

THERE is no better time to consider the question of tram-car heating than in the summer months. As a rule the subject is not mooted out until the approach of cold weather, when tramway managers are forced to its discussion by the complaints of their passengers; and by the time they are ready to take some action the winter has passed, and the question is once more relegated to the future. In this field there is room for the inventive genius, and no time is as good as the present for him to exercise his talents.

CABLE RAILROADS.

(Continued.)

BY W. W. HANSCOM, M. E.

(Written for the AMERICAN RAILROAD JOURNAL.)

IN the form of grip described and illustrated in last month's JOURNAL, the opening for the admission to and between the jaws is at the under side, so that by lowering the grip the rope will enter between the open jaws. Then by partially closing the jaws the rope is enclosed between them sufficiently to raise it, but yet allow it to freely slip through. As the rope or cable lies in a groove in the carrier-sheaves which support it along the tube, the grip in passing must be at such a height that it will not strike the sheaves in passing over them, and at the same time must hold the cable firmly. In order to start the train, the jaws are now brought together, clamping the rope gently but continuously; that is, the operation of closing the jaws on the rope for starting is to be continuous, not intermittent. Not with a very sudden movement nor a very slow movement, but one which is easily determined by a little practice. The object is to start the train gently, and yet not allow too much slipping of the cable through the jaws of the grip. To avoid the chafing of the cable and consequent wear when the cars are standing still and the cable running through the grip, four rollers are provided and attached to the grip, two being placed opposite each other, and the others before and behind the gripping jaws. These rollers are carried by two bars, one on each of the separate parts which carry the jaws, so that as the latter are moved to or from each other, the rollers are similarly moved. The bars which carry the rollers are themselves guided by studs, which have springs so adjusted as to press the bars and rollers against the cable and also to yield when the rollers are pressed hard, as in the act of gripping the rope.

It will be seen that the rollers are placed at an angle of thirty degrees with a horizontal line, and in adjusting them they are advanced about one-eighth of an inch ahead of the jaws, so that they may still hold the cable when the jaws are moved back to allow it to slip freely through them without chafing. As the jaws are again brought together, the springs behind the rollers yield and allow the cable to be clamped by the jaws with the desired force. These rollers are grooved on the face to correspond with the diameter of the cable, so that they may hold the cable within them when the jaws are opened. They are so placed in reference to the jaws that they will come in contact with the cable just before them and will serve to hold it from coming in contact with the jaws until the latter are brought close together by the wedge, screw and hand wheel, when the springs, behind the bars, which carry the rods, will yield, allowing the jaws to take the rope and move the train. And right here is one of the most important points for the man who manages the grip, to learn. That is, to close the jaws upon the cable so that in starting a train the least amount of slipping of the cable through the jaws may occur, consistent with a gentle primal motion. The greater the amount of slip of the cable through the jaws when in frictional contact, the greater will be the wear. There are the same considerations noticed in starting a train of cars propelled by a cable as in starting an ordinary railway train. Either may be started with or without shock, and the same comparative wear and tear results from the action of the engineer or gripman in either case. It has been found by experience, that starting a car gently, produces the least amount of wear upon the cable.

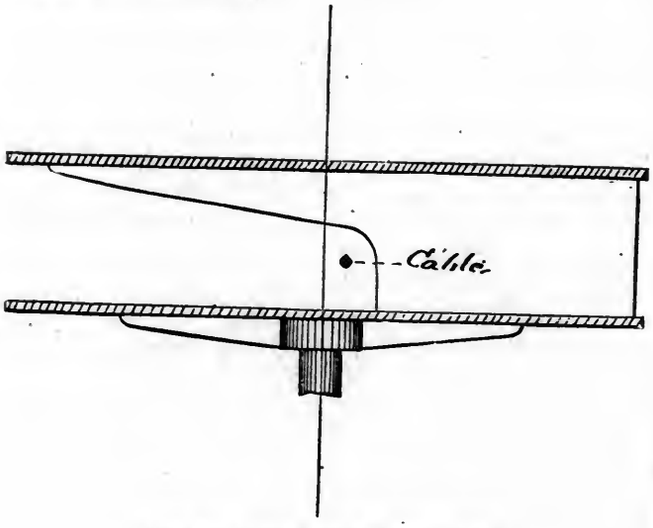


TABLE IN LINE ACROSS MAIN TRACK.

It has been before stated that the grip can be raised and lowered vertically to "pick up" the cable. The object of the construction of the Clay street road grip is that should the cable require to be dropped from the grip from any cause, or should any street obstruction prevent the cars from moving for some time, the rope can be released from the grip and avoid unnecessary wear, and can at any time or place, except immediately over a carrier-sheave, be "picked up" easily.

At the ends of the road the cable is carried around a horizontal sheave whose diameter is equal to the distance apart of the two tubes in which the cables run between the two lines of rails; that is, so that the rope will lead on and off the carrier-sheaves fairly in the two tubes. As the cars and dummies have to be switched from one line to the other, it is done on this road by two turn-tables, each table having its center line coincident with the center of the tube, and their diameter being a little less than the distance between the centers of the tubes. The turn-tables are geared together, so that when one is turned the other must move also. Between the circumferences of the tables are short pieces of track, reaching from one to the other.

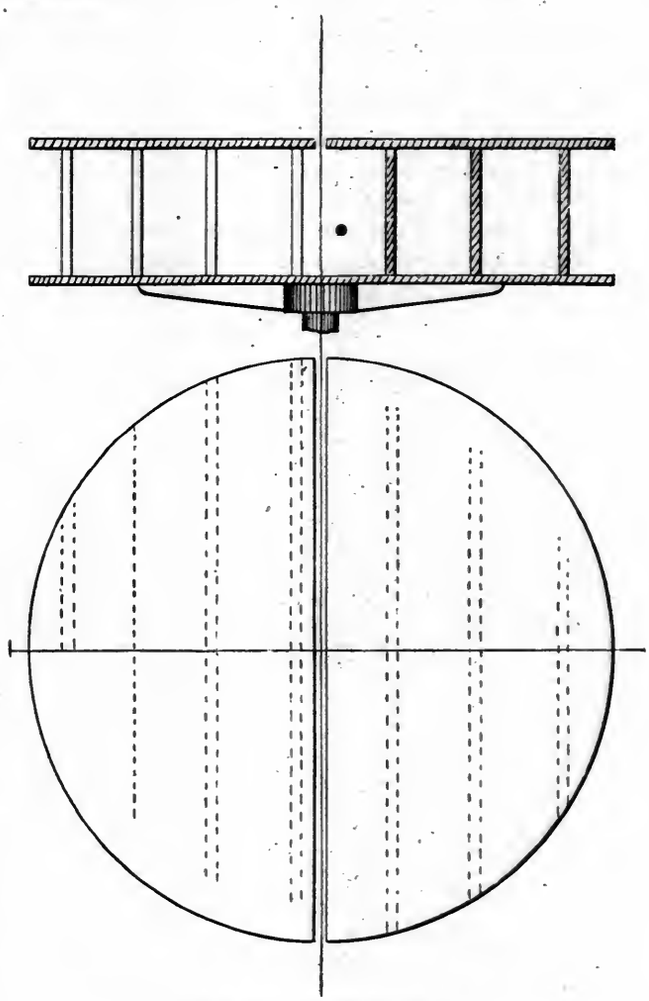


TABLE IN LINE WITH TRACK.

When a car is run on the table, it is turned one-quarter of a revolution, and this brings the rails on both tables in line, and the car is then run on to the other table; and by turning the table back again one-quarter revolution, the car is brought in position to go out on the other track. These tables are so constructed that the slot for the shank is continued across the diameter, and an opening is provided under the surface corresponding to the shape of the tube, so that the car may go on the table and be transferred across the two tables and to the other track without using the grip. The tables are identical in form, and are constructed of two plates, an upper and a lower plate; the upper plate being split across the center to allow the grip to pass, and the lower plate being whole, having under the center of the bottom a hub, from which a shaft projects downward for support, and upon which the table turns. The upper and lower plates are separated about eighteen inches, and are connected together by cast brackets, ribs

or ties, each half of the upper plate being supported from the lower plate. Not only does the grip pass through the table, but the cable itself, and as the table has to be turned one-quarter revolution, the supports for the upper plate must be so arranged that the cable will not come in contact with them when it is revolved. Therefore the supports from the bottom to the top plate must each project from not more than one-quarter of the surface of the bottom, and they must be on opposite sides of the cable, so as to support evenly the plate above.

The illustration shows clearly the construction required to allow the grip and rope to go through the table, and also to allow the table to be turned through a quarter revolution and yet not come in contact with the cable. As before stated, two of these tables are used, and the lines of centers are placed along the center line of each track, so that when in one position, a car may be run on one of them, and then by turning the two tables one-quarter of a revolution, the tracks on the tables will be in line, and the car may be run from one to the other.

(*To be continued.*)

More About Steel Rails.

[COMMUNICATED.]

To the Editor of the American Railroad Journal:

I HAVE thought it best to give the following explanation of my communication to you on "Iron *vs.* Steel for Horse Railroad Tracks," published in your April number. During the eighteen years of my engineering experience, I had never received an offer for old steel rails. I examined five years' files of my *Railroad Gazette*, containing weekly quotations for old iron rail values, without finding one quotation for old steel rails. I called on the president of one of the largest rolling mills in this country, and he said he would not give $5.00 per ton for old steel rails delivered at his works. I then wrote the communication to you. Upon the assumption that old steel was worth little, if anything, old iron worth $23.00 per ton and the relative wear the same, *no street railroad company could afford to lay steel rails in its tracks.* After sending you the article, in talking with another well-known engineer, to my surprise he said he would pay $19.00 per ton for old steel. I then wrote requesting you to return my manuscript, but it was already in print, and I let it pass with a few alterations.

Mr. Wm. Wheaton, Jr., writes me that in his experience the steel rails wear the longest. Mr. J. T. Gordon, on the other hand, has obtained the best results from iron. I candidly admitted that from my street railway experience, I could not give the relative life of steel and iron.

I cannot agree with Mr. Moxham that the conditions of wear on horse railroads and on steam railroads are the same. I do agree with him that the steel is more homogeneous, but on the other hand there is an unfailing demand for the old iron rails. Buyers constantly solicit me to sell them old iron, but with the exception noted above, no one has asked for our old steel.

The object of my communication was to get facts as to wear of both iron and steel, from the men who had used both in tracks. In other words, practice instead of theory.

Respectfully,

AUGUSTINE W. WRIGHT.

CHICAGO, June 9, 1884.

Glass Pulleys for Cable Railways.

THE Cleveland *Herald* contains an interesting article tending to prove that glass could be made to take the place of iron and other materials for certain mechanical purposes which has lately been exemplified in the manufacture of glass pulleys for cable railways. For such purposes the advantages of glass pulleys are obvious. In cable railways such as are in use over the Brooklyn suspension bridge and in the streets of some of the cities, the operation of the cables over metal pulleys has resulted in serious damage to them from the friction with the pulleys. When the pulleys are of metal the friction is a maximum one, but no other substance hitherto could be found sufficiently strong and tenacious to take its place. Glass pulleys will reduce the friction to a minimum and they will last for an indefinite time. Mr. J. J. Hardin, of Chicago, has a number of different sized pulleys made for experiment. They are about thirteen inches in diameter and about two and one-half or three in width, with a groove in the center of the rim to receive the cable. However, only the rim or tire is of glass, the interior part being composed of iron made in the form of a spider, which fully supports the glass exterior. In this spider is a hole for the reception of the axle upon which they run. The thickness of the glass from the surface of the rim to the iron part of the spider is only about three-fourths of an inch, but the glass is made extra tough and strong, and the pulleys have been proved capable of successfully resisting any pressure brought to bear upon them.

Tramways in France.

A RETURN relating to the tramway system in France gives the total length of lines at about 332 miles. The department containing the longest mileage is, of course, that of the Seine, which includes Paris. Here the length is about 120 miles. Besides Paris, the towns which have tramways running are Lyons, Marseilles, Havre, Rouen, Beziers, Tours, Nantes, Orleans, Rheims, Nancy, Cambrai, Dunkirk, Lille, Roubaix, Tourcoing, Valenciennes, Boulogne-sur-Mer, Calais and Versailles. The total receipts for all the lines during 1883 were about $7,130,000.

TRAMWAY NOTES.

THE State railroad commissioners of Massachusetts have granted the application of the Meigs Elevated Railway Company for a certificate deciding that public exigency exists for the construction of such a road in Boston and Cambridge. Formidable opposition was expected, but there was none. It is now necessary to obtain consent of the city authorities for a definite location and to secure the permission of the harbor and land commissioners for crossing the Charles river.

THE new tramway between Salem and Marblehead, Mass., has been organized under the corporate title of the Forest River Street Railway Company. Its directors are W. B. Brown, of Marblehead, J. P. Peabody, Z. A. Gallup, Frank Cousins, A. W. Mooney, George Z. Goodell, and W. D. Dennis. Mr. Dennis is temporary president, H. M. Brooks, treasurer, and Joseph F. Hickey, clerk. Stables will be built in Marblehead.

THE Aldermen's Railroad Committee, of New York City, will give a hearing on Aug. 5 to persons interested in the application of the Cable Railway and the Broadway Surface Railroad Companies.

THE adoption of the cable system is being discussed by the tramway managers of Boston and St. Louis. It is also stated that elevated railways will soon be introduced in these cities.

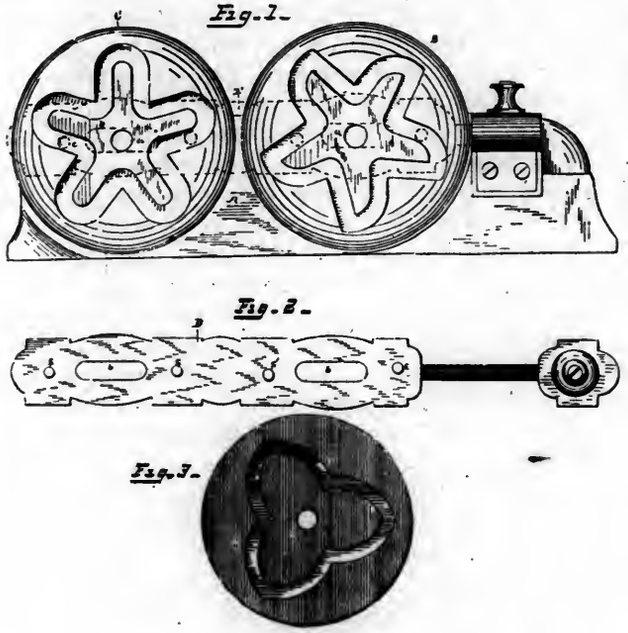
SEVENTY-SIX tramways and light railways have lately been projected in Ireland, representing an aggregate capital of $25,000,000.

THE Ashland Street Railway Company, of Madison, Wis., has been incorporated with a capital stock of $50,000.

New Inventions.

Device for Overcoming Dead-Centers and for Converting Motion.

IRVING L. HAWKINS, of Windsor, N. Y., is the inventor and patentee of a cheap and simple device for obtaining a continuous rotary or reciprocating motion and imparting it to various kinds of machinery; and also at the same time obtaining a rotary reverse motion from a single piston, overcoming the dead-center, and retarding or accelerating the motion by the application of interchangable wheels upon the same journals and piston.



HAWKINS' DEVICE FOR OVERCOMING DEAD-CENTERS AND FOR CONVERTING MOTION.

The accompanying cuts illustrate the device and its application. Fig. 1 is a representation of the invention with the fly or three-pointed cam wheel and piston removed; Fig. 2 is a view of the piston detached, and Fig. 3 is a view of the three-pointed cam wheel detached. A indicates a frame, to which are secured the axles *a a*, on which the wheels are journaled. B indicates the wheel, which is preferably placed upon the forward journal. This wheel has one of its faces provided with a waved or convoluted cam-groove, the center of which represents in outline a five-pointed star having its radial arms slightly curved outwardly and lateral to a pointed terminal forming the inner walls of the groove in which travel the two forward pins of the piston. The reverse wheel C, which is placed upon the rear journal, has the outer walls of the groove oblique and semicircular alternately, as shown, with the arms of the star conforming to it in outline, so as to have the walls of both parallel with relation to each other for the free and easy passage of the piston between them. D indicates the piston, which is provided with two elongated vertical slots *b b*, for the passage of the wheel-journals, respectively. This piston is provided with vertical pins *c c* and *c' c'*, which project from the opposite sides thereof, to engage respectively the grooves of the wheels; the two forward pins being on the same horizontal plane, while the two rear pins are arranged, respectively, on a line, or nearly so, with the longitudinal walls of the rear elongated slot. By this arrangement of the pins upon the piston, when the wheels are placed upon the journals, as before described, and the pins brought in engagement with the grooves of the wheels from one side and power applied to the piston, both wheels will be driven in the same direction; but by removing the piston and reversing it upon the wheels, so as to change the rear pins with relation to the grooves of the rear wheels, the forward wheel will be driven in the same rotary direction, while the rear one will take a reverse movement. In some cases a third wheel is used, which may have a three-pointed cam-groove, and may be placed upon the journal of one of the other wheels; and, if desired, a fourth wheel may be used on the journal of the other wheel. The device is not confined to any number of wheels or points in their grooves, as a greater or less number may be employed, according to the nature of the machine to be operated and the movement required.

It is claimed for this invention that it will be found particularly valuable in mowing-machines for driving the cutting apparatus, as a continuous reciprocating motion may be obtained with but little power. It may also be successfully applied to locomotive-engines for operating their drive-wheels, and to various other machines with a beneficial result.

Automatic Locomotive Whistle Attachment.

THE inventors of the device named in the title, are Jacob W. Strickle and Harry W. Manning, of Huntsville, Alabama. Its object is to produce a simple and effective device by which the steam-whistle of a locomotive engine can be automatically sounded when the locomotive is approaching a crossing or any other part of the road where it is desired to give warning of its approach.

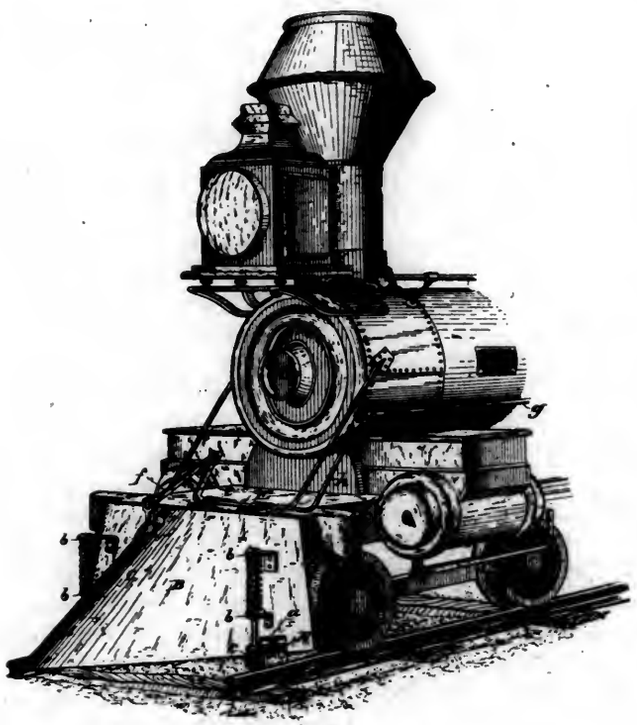
A forked bracket is provided, which may be securely attached to any suitable part of the locomotive. To the bracket is pivoted a curved drag-bar provided near its free end with an enlarged portion, which rests in a slotted supporting and guiding bracket, conveniently attached to the frame work of other stationary part of the locomotive, the slot in the bracket serving to prevent the lateral displacement of the drag-bar. To the bracket is pivoted a lever having a loose pivotal connection with the drag-bar. A spring catch is secured to the fire-box or other suitable part of the locomotive by a supporting bracket adjacent to the free end of the drag-bar, the free end of the drag-bar being preferably recessed, thus forming a small fork embracing and steadying the spring-catch. To the long arm of the lever is secured a cord or wire connected in any suitable manner with the lever, which operates the steam-whistle of the locomotive, and to the spring-catch is connected, by means of an eye, or otherwise, another cord or wire running to the cab, where it will be arranged so as to be conveniently reached by the engineer. A cam or tripping device is bolted to the ties of the roadbed within the rails, and at such a distance therefrom as to engage the drag-bar at the passage of the engine.

To operate the whistle, the engine being in motion forwards, the drag-bar will strike against the stationary cam or tripping device, raising the free end of the dra-gbar to the top of the spring-catch, which will instantly spring for-

ward under the end of the drag-bar, and thus sustain it in an elevated position. The upward movement of the free end of the drag-bar will cause the long arm of the lever to descend, by reason of the loose connection of the lever and drag-bar, thus pulling downward on the cord or wire secured to it, which, by its connections with the steam-whistle, will cause this to be sounded until the engineer causes the disengagement of the drag-bar from the spring-catch by pulling on the second-named cord or wire, when the drag-bar will fall by gravity to its first position, and thus be in readiness for the next crossing.

Owing to the curved construction of the drag-bar and the cam or tripping device, it is obvious that the drag-bar will be raised by the tripping device when the engine is moving either forward or backward; but, if it is desired to have the whistle sounded when the engine is approaching a crossing, when moving backward as well as forward, it will of course be necessary to place tripping devices on both sides of the crossings, and also near both rails, the invention being applied to the side of the engine.

Rothrock's Safety Devices for Locomotive Pilots.

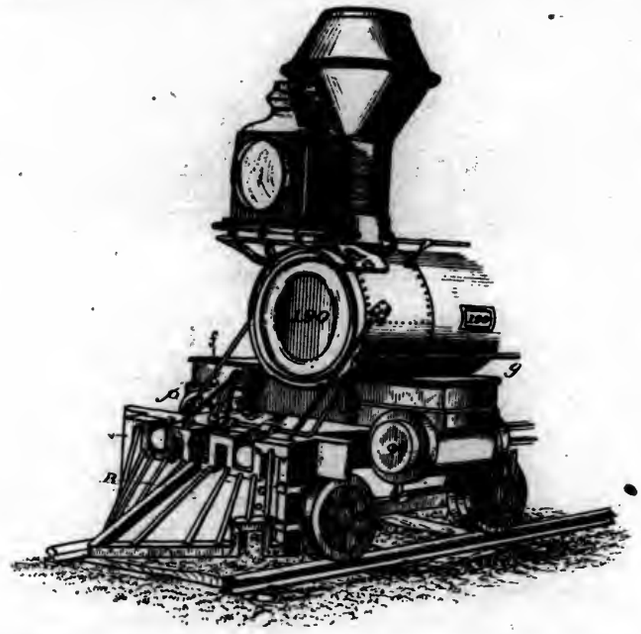


ROTHROCK'S SAFETY DEVICES FOR LOCOMOTIVE PILOTS. FIG. I.

OSCAR ROTHROCK, of Beech Creek, Pa., is the inventor and patentee of two safety devices for locomotive-pilots, which are herewith illustrated. The general principle is the same in both, the one being a modification of the other. The inventions are designed to provide safety attachments or guard devices for locomotive-pilots or cow-catchers, their object being to remove obstructions, whether animate or inanimate, from the track and prevent the train from passing over them. The pilot or cow-catcher of a locomotive, as ordinarily constructed, does not extend to the track-rails, and hence it frequently happens that an animal or other object, after having been struck by the pilot, drops again in front of it, or is brought into such a position that the locomotive and train pass over the object, consequently rendering the train very liable to be derailed and causing loss of life and property.

The first device as illustrated in Fig. 1, consists of a sheath or hood which conforms to the shape or contour of the pilot, and is made to slide up and down on the outer or inner surface of the same. The bottom edge of the sheath is provided with two notches, which receive the track-rails and permit the central portion of the shield to sweep the space between said rails. The sheath slides up and down on roller-ways on the pilot-bars, and is combined with suitable mechanism for operating it from the cab of the locomotive. The sheath, when lowered to its full extent, projects beyond the track-rails and moves in close proximity to the cross-ties or sleepers, so as to prevent effectually any obstruction from passing under the pilot. The sheath may also carry the brushes for sweeping the track-rails, and the scoop and hose for taking up water when the train is running. Fig. 1 is a perspective view of the front portion of a locomotive and its pilot or cow-catcher, the latter having a covering sheath or hood which is capable of sliding on roller-ways. The pilot A is of the customary form and construction, formed of inclined bottom bars converging to a nose or point and the rearwardly-inclined vertical bars, constituting the grated body portion. A sheath or hood B, made of metal, gutta percha, wood, or other suitable material possessing the requisites of strength and rigidity, is fitted on the outer surface of the pilot, and is of a corresponding shape and size. A suitable number of the inclined vertical bars of the pilot are provided with anti-friction rollers or balls which are set in grooves or seats made in the bars. The sheath or hood slides in contact with these rollers, the latter serving to permit the shield to move freely at all times. The extreme lower part of the sheath may be made of hard rubber, when desired, the remaining or body portion being preferably constructed of solid sheet metal. The sheath or hood, covering the pilot in the manner stated, may have interior ribs, which slide in the roller-ways of the pilot-bars, so as to prevent the lateral displacement of the sheath and maintain it always in a working position. Other means, if desired—such as guide flanges or strips—may be resorted to for holding the sheath in proper working relation to the pilot. The bottom edge of the sheath is provided with two notches *a*, which are so disposed that the sheath can pass down on each side of the track-rails when it is lowered to its full extent. Suitable holders or sockets *b*, are located in juxtaposition or in line with these notches for receiving and retaining the brushes *c*, which serve to sweep the track-rails, these brushes being of such size or so arranged that they will only sweep the rails when the sheath is sufficiently lowered; or, when the brushes encounter objects lodged on the rails, they will serve to remove them. The means for raising and lowering or operating a safety-sheath or guard device applied to a pilot and constructed in the above-described manner depends altogether upon the character of the locomotive or the position of the cab; it being understood that the sheath is designed in all cases to be under the control of the engineer, so that it can be quickly and easily operated for the purposes intended, and any suitable mechanism for raising and lowering it can be employed. In the present instance is illustrated an operating mechanism for the sheath which consists of a rock-shaft E, located at the front of the loco-

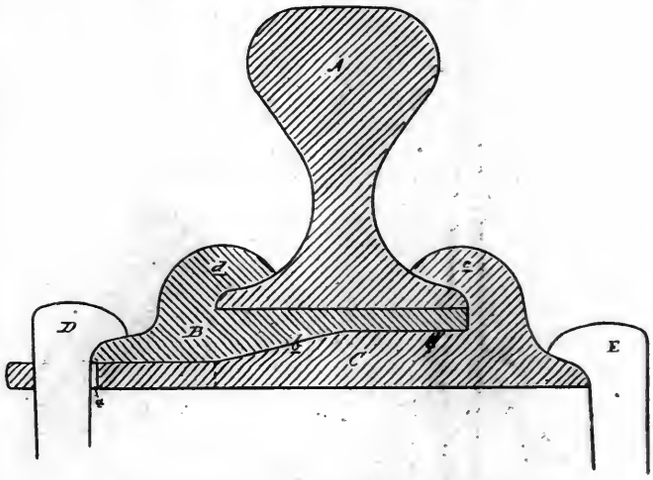
motive-truck, and having an arm *e*, connected with a link *f*, extending from the center of the upper portion of the sheath. A rod *g*, connected with an arm *h*, on the outer end of the rock-shaft, extends to a vertical lever which is located in the cab of the locomotive, and has a suitable pawl or spring-catch for locking it to a notched segment or plate, or other holding device. It is manifest that when the lever is locked in one position, the sheath is held in an elevated state, as is shown in the figure, so that the sheath will not project beyond the bottom bars of the pilot. When the lever is released, the weight of the shaft suffices to let it drop until it is again locked. When approaching cattle on the track, the sheath is lowered to within such a distance from the rails that there will be no liability of danger should an animal be struck and fall in front of the locomotive. In such an event the guard device, in connection with its rigid backing, would throw the animal to the side of the track. When obstructions exist on crossings, switches, etc., the sheath is lowered to a point just level with the rails, so as to throw such obstructions outwardly from the track. In position where no objects such as switch-rails, frogs, etc., are between the track-rails, the sheath can be lowered to within a short distance of the sleepers or cross-ties, so as to permit the engineer from his seat to throw off any object from the rails. Guide posts may be located at the side of the track for indicating the nature and position of obstructions which will prevent the shield from being lowered to its full extent.



ROTHROCK'S SAFETY DEVICES FOR LOCOMOTIVE PILOTS. FIG. 2.

Fig. 2 represents the second device for the same purpose, and it will be seen that it is a modification of the first. In the second device the sheath or hood is dispensed with and its properties are incorporated in the pilot itself. A is a beam on the front of the locomotive, having two posts *p p*, (one of which is shown in the drawing) attached on each side of its lower portion. These posts extend down to the bottom of the pilot when it is in its elevated position, and have attached to them the guides *o o*. These guides inclose that portion of the pilot marked *v v*, so that the pilot is free to move up and down. The upper portion of the frame-work of the pilot is constructed so as to provide the spaces *n n*, for the reception of the buffers and draw-head, these being separate and distinct from the pilot. The lower side portion of the frame-work of the pilot is also of a construction that provides the arches *a a*, (but one of which is seen in the drawing), for the reception of the rails when the pilot is lowered. This device is operated in the same manner as that first described.

An Improved Railway Rail.



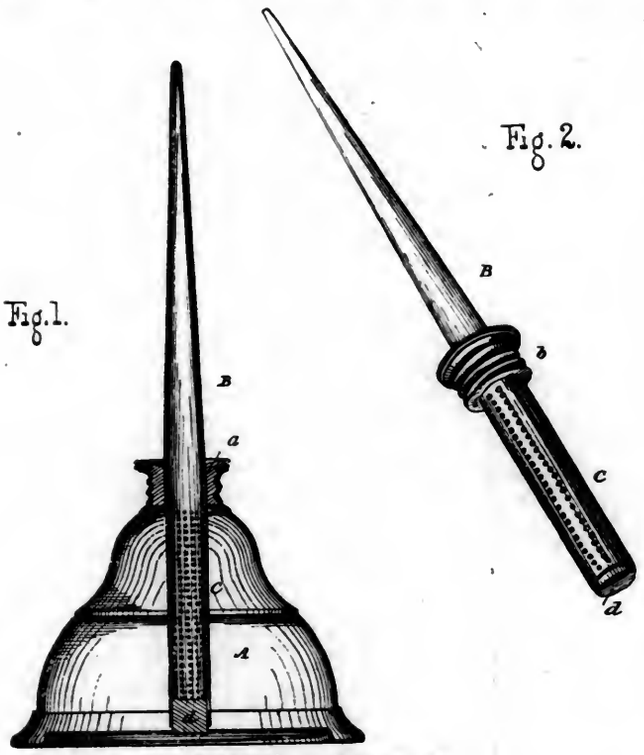
HOUGHTON'S IMPROVED RAILWAY RAIL.

THE accompanying cut illustrates an improvement in rails invented by Rufus A. Houghton, of Defiance, Ohio. C represents a metallic bed-plate of any desired length, which is provided with the upwardly-projecting hook-flange *c*. The upper face of the bed-plate C has a portion *c'*, extending parallel with its under face to a line formed by its junction with a vertical plane passing through the center of the rail, and from this line it inclines downward, as shown at *b*, until it reaches a point directly opposite the foot of the rail, when it again extends in a horizontal plane parallel with its under face, in this manner forming a broken surface. Upon this bed C rests the intermediate plate B, which is also provided with the upwardly-projecting hook-flange *d*, the under face of this intermediate plate B, being shaped to conform to the upper face of the bed C. In practice, the two plates C B are placed upon the ties. as shown in the illustration, their hooked flanges embracing the foot of the rail, the parts being held in place by spikes D E, the former of which may pass through slots *a* in the edge of the plate C, which projects beyond the plate B, the spikes being driven so as to force the hooked flanges *d c* toward each other and compel them to grasp firmly the foot of the rail. By this construction of parts is provided an interlocking device for securing the rail in place, which can readily be laid so as to break joints, while the employment of fish-plates and bolts, as generally used, is dispensed with. The device may be modified so as to dispense with the holes *a*, by forming the foot of the plate B, in such a manner that it will overlap the inner edge of the bed-plate C.

The advantages claimed for this device lie in the fact that the bed-plate as well as the intermediate plate are made with the greater bulk of metal directly opposite the hook, at the precise point where the greatest amount of strain may be expected; while the hook itself is of the shortest length consistent with the required strength.

A Patent Oil Can.

THE object of this invention, a cut of which is herewith furnished, is to provide an oil-can in which the clogging of the escape-tube by foreign matter is rendered impossible. Fig. 1 is a vertical section of the can as ready for



ENGLISH'S PATENT OILCAN.

use. It will be seen that the escape-tube B, instead of terminating at its junction with the body of the can A, extends in the form of a perforated cylinder C, almost to the bottom of the can. The lower end of this cylindrical and perforated section is fitted with a plug *d*, which may be drawn out at pleasure. The can is of the ordinary construction, and is provided with the usual screw-threaded mouth or opening *a*. Fig. 2 is a perspective view of the tube detached from the can, and its construction is evident. The tube is provided with a screw-cap *b*, and as the tube itself tapers, this cap is slid thereon and forced downward upon it until it is securely attached. The lower side of the cap is closed tightly around the section C, of the tube, so that oil can only be ejected from the can by first passing through the perforations of the tube, which strain it thoroughly, and prevent the passage of any foreign matter. The device may also be used in the construction of kerosene cans and other vessels employed for filling purposes.

The patent oil-can is the invention of Robert English, of Austin, Texas.

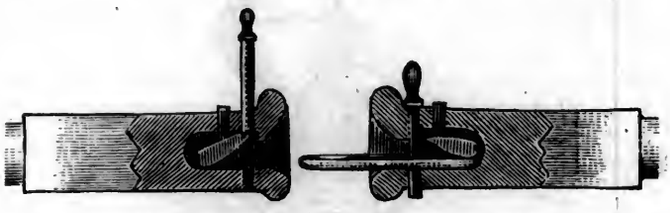
A New and Simple Nut-lock.

THE invention to be described is of that class of nut-locks used upon railway rail-joints which consist of a slotted or notched plate, into the slots or notches of which the sides of the nuts fit. Thomas Bell, Akron, Ohio, is the patentee. His lock is so made that it does not interfere with anything already on the rail, unlike some nut-locks which cut the first plate upon being fastened. It is believed to be the most simple thing of its kind yet devised, and can be manufactured at a small cost. No. 12 hooping, an inch and a half wide is needed, from which the plates can be cut. The washers can be made from No. 8 iron, one inch and three-quarters wide. A few of these nut-locks are in use on the Cleveland, Akron and Canton sysem, with satisfactory results. They hold a hexogonal as well as a square nut,

The peculiarities of Mr. Bell's nut-lock are best indicated in his claim, which is the combination of two nutted bolts, two wire loops slipped around the bolts below the nuts, and a plate fitting with its ends between the nuts, the ends of the plate being notched correspondingly to the nuts, and held in place by the ends of the wire loops passing through perforations in the plate, and twisted together; also the combination of two nutted bolts, two wire loops slipped around the bolts inside the nuts, washers having sector-shaped notches and fitting upon the bolts inside the nuts, and a plate fitting with its notched ends between the nuts, the notches in its ends corresponding in shape to the shape of the nuts, and held in place by the ends of the wire loops passing through perforations in the same, and twisted together upon its outer side.

An Automatic Pendulum Coupler.

ISAAC H. TRABUE, of Louisville, Ky., is the inventor of a car-coupling device that commends itself on the grounds of simplicity and cheapness. As seen in the accompany-



TRABUE'S AUTOMATIC PENDULUM COUPLER.

ing cut, a pendulum attachment is inserted in the draw-head, by means of which both the link and pin are held in the required positions until the draw-heads come together, when the cars couple automatically. The common link and pin are used and the device may be employed on cars of uneven heights. In this event the link is placed on the higher car and is drawn from under the pendulum far enough to hang in such a manner as to suit the draw-head of the approaching car. The operation of coupling is fully shown in the illustration, and the pin may be attached to a chain or lever extending from the top or side of the car. The pendulum will sustain either a straight or bent link. The device is sold for a trifling sum and can be readily attached.

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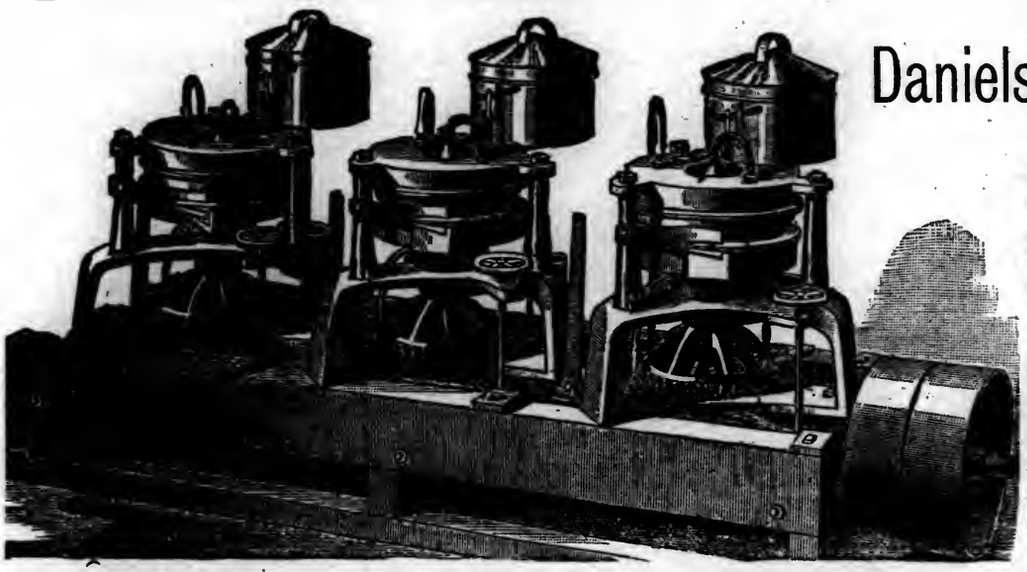
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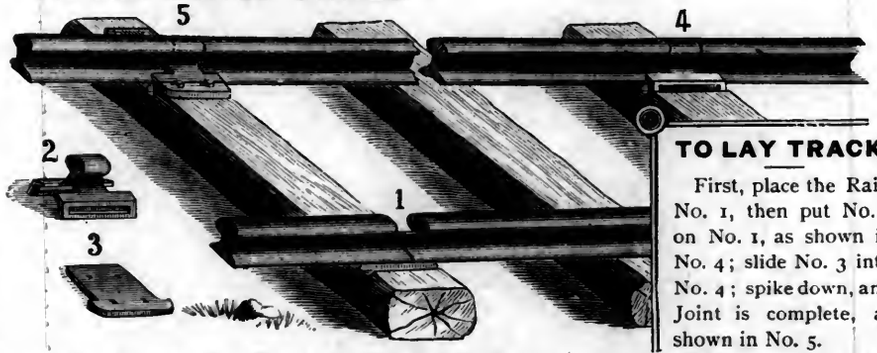
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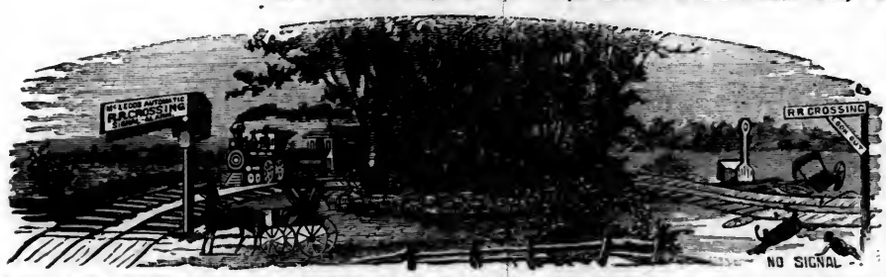
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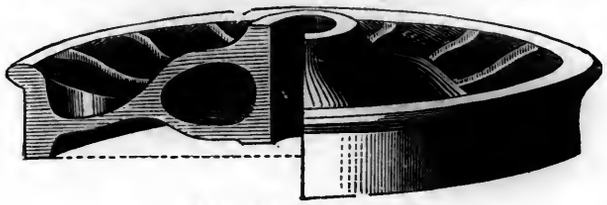
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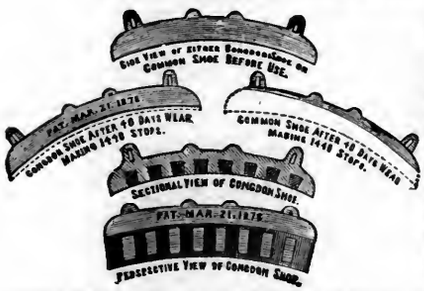
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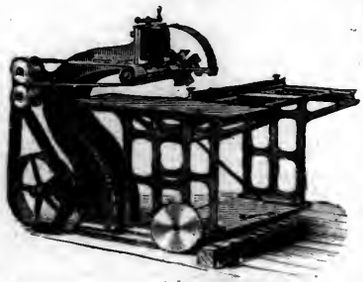
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WHOLE NO. 2,555.] NEW YORK, AUGUST, 1884. [VOLUME LVIII.—No. 5.

THE COMING CAR-COUPLER—SHALL IT BE AUTOMATIC?

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE time is now at hand when it is comparatively safe for anyone to give his views on this thread-bare subject, providing he does it in a mild, sensible way. It is not long since that persons who dared say "car-coupler" to a railway official were considered cranks and treated as such. In most instances the term was not misapplied, and it is safe to say that not one in a hundred of the couplers that were placed before railway officers for inspection possessed any merit whatever. To such an extent had car-builders and others been worried by the owners or agents of these worse than useless contrivances that they came to regard all new coupling devices as worthless. Occasionally some automatic coupler was given a trial, which only served to strengthen their determination to have nothing to do with *any new couplers*. They could hardly be blamed for taking this course, but in throwing away all the chaff they have lost some wheat that would have been well worth saving. Though keeping along in the even tenor of their way, maiming and killing people with no apparent effort to prevent the increasing destruction of life and limb, it has become clear that something must be done to prevent this unnecessary loss of life. Not only the public at large, but railway officials are taking a more lively interest in the matter than formerly, and the indications are that a vigorous move will soon be made to select and adopt such coupling devices as seem to be up to the required standard of merit. Railway managers have been so slow in the matter that legislative authorities have thought proper to enforce a recognition of the importance and necessity of adopting some device that will render the coupling of cars a safe operation. It is to be regretted that the authorities have found it necessary to act in the matter, for, as a rule, lawmakers know little of the requirements of railway appliances, and unwise legislation in the matter would do more harm than good. Some of the State legislatures have enacted that railroad companies in their respective States shall adopt some form of automatic coupler, while Congress also has the matter in hand; and it would seem that if there is to be any legislation in the premises, the whole question should rest with the latter. It is obvious that whatever coupling device is adopted it should be uniform throughout the country, and local authorities should not tinker with the matter at all, but leave it to Congress; and if the general government makes a move in that direction, it would be well to appoint a committee of experts from among well-known practical men of undoubted integrity to test such devices as appear to have sufficient merit to warrant a trial. It has been said by some railroad men that life is too short to make a thorough examination of upwards of three thousand patent couplers and select a half-dozen of the best for trial, but it should be remembered that nothing good can be secured without some labor and painstaking, and moreover the great labor attending the selection of the best couplers for trial is more fancied than real. A committee of five experts might, by dividing the work in the patent-office into sections, each one taking a section, dispose of five hundred models, or drawings where there are no models, in a day. Let each one make a note of such as he would consider worthy of special notice, and when all the models and drawings have been examined, let a committe of the whole again examine those that have been marked as of superior excellence. As a rule the worthlessness of these coupling devices are apparent at a glance and can be disposed of without delay, and a week, or at most ten days at the patent office should enable the committee to select all that would be worthy of trial. Thus it would be an easy matter to test the candidates for general use and render an impartial decision as to their relative merits. No doubt if such an arrangement were carried out, some of the financial backers of these contrivances would be on hand to swell the bank accounts of the members of the committee, but the right men for that place would not accept bribes. This has been urged as an objection to such an arrangement, but the idea was born of the readiness with which many railway officials "divy" with those who furnish them with supplies of inferior quality at good prices, or sell them alleged improvements that are a source of trouble and expense rather than a benefit. "But," as a prominent railway official remarked a few days since, "it is evident that something must be done by way of preventing this needless slaughter of brakemen and others in coupling freight-cars. The only way out of this difficulty is to select the coupling device that we believe to be the best, and put it to immediate use, and not delay any longer for fear we shall not get the best. It is clear that if we do not take the initiative, the authorities will compel us to do something that would be disagreeable, and not for the best interests of either the railway community or the public at large."

A large share of the public have become so uncharitable or unreasonable as to charge railway managers with a total disregard for the safety of their employés, and assert that they would rather kill a hundred men than pay a few thousand dollars for a safety coupler. In making this assertion these people do not comprehend the almost insurmountable difficulties that must be encountered in providing a safe coupling device that will fill the necessary requirements of such an appliance; nor do they seem to be cognizant of the fact that railway companies pay enormous sums annually for employés who are killed or in-

jured in their service. Do they suppose for an instant that any railway manager is so heartless as to refuse to pay a reasonable sum for a safety appliance that is not loaded down with objectionable features, as is the case with most of the so-called automatic safety and other complicated impractical coupling contrivances that have flooded the country during the past decade? Enough money is paid every year to the victims of coupling accidents—or their families, in case of fatal injury—to purchase a first-class safety coupling appliance, if it were to be had; and it is hard to believe that there is a man living who would wantonly destroy life and limb when the very prevention of these accidents would pay all expenses now attendant thereupon. If a company has been in the habit of paying $50,000 a year, more or less, for killing or injuring employés engaged in coupling, they would willingly pay double that sum for a device that would effectually prevent such accidents, if satisfactory in other respects. The paying for injury is repeated every year, or as often as accidents occur, whereas one payment for the safety coupling suffices for all time; so that when the right coupling is found and brought into universal use, many valuable lives will be saved and much money by the railway companies, not to mention the avoidance of the misery and suffering of the maimed, and the grief of widows and orphans.

In view of the foregoing facts it is now in order to cast about for some coupling arrangement that is at once cheap, durable and reliable. By "cheap," it is not meant that some shabby affair that can be had for a trifle should be adopted, but that large prices shall not be paid for inferior articles if something satisfactory can be had at a moderate expenditure. The cost of coupling devices ranges from the "sticks" that cost a few cents per car, up to the automatic couplers which cost from $30 to $50 or more per car, and are objectionable on account of cost and lack of merit. The "stick" has been tried, and is not satisfactory. Mr. Charles Paine, when General Superintendent of the Lake Shore Road, equipped his freight trains with coupling sticks, but they soon went out of use. Although they contributed somewhat to the safety of the men, they were broken and lost, and many of them were thrown away by the men who did not like them, and therefore their use was abandoned. It was a clumsy business to guide a link at the end of a stick long enough to allow the operator to stand out of danger. Couplings were not always made on the first trial, and the sticks were broken after short use by being caught between the draw-heads and crushed, and finally, on many occasions, the coupling had to be made by hand. Some other roads are trying the coupling-stick, but they will soon abandon it. But it does not follow that because the sticks that cost but a trifle are not satisfactory, that the automatic couplers that cost $45 per car, more or less, should be brought into requisition unless they should prove eminently satisfactory in every respect. And it is an open question whether *any automatic coupler* would be satisfactory, putting aside the question of cost. If they were sure to couple at all times they would be an element of safety, but also a source of trouble in operating in yards or where switching is being done. Cars would frequently couple when it was not desired that they should, and if they are set so as to not couple, it requires the presence of the operator in either case, so that it saves no trouble to train or yard men. But it seems from recent trials of automatic couplers that they frequently fail to connect, which is a serious objection. And even if a coupler were so constructed as to act with unvarying accuracy, the above-mentioned objections would remain, and, moreover, they would soon be "knocked out" by the rough usage to which they would be subjected. Although some managers are calling for an automatic coupler, it is safe to say that it will be a long time before they will find one that will behave to their satisfaction in all respects. As to train and yard men, they will be satisfied with any appliance with which they can couple with the link and pin with no possibility of injury to their persons. It is conceded by nearly all railroad men that for freight-cars the best coupling in the world is the link and pin were it not for the danger attending its use. It accommodates the train to all movements, vertical and lateral, and compensates for all irregularities of track more effectually than any other coupling.

A recent invention provides a very simple and effective device for guiding the link so that the coupling is made without the operator going between the cars, and there is no possible chance of injury. The device has been thoroughly tested and is satisfactory in every respect, while it can be applied to any freight car without any alteration, at a cost of less than $4 per car, including royalty. There is yet another patented method of manipulating the link and pin which is more complicated than the one above mentioned, and costs $10 per car, not including royalty. It would seem that railway companies would prefer something of this kind that is perfectly safe and reliable, and can be procured at the prices named, to the more costly and less efficient automatic contrivances. The latter, in most cases require an entire change of draw-tackle and fixtures to apply the automatic couplers, and if one road is equipped with them their cars could not couple with cars of other roads not similarly equipped, and it is thus plain that no such change can be made with satisfactory results. But with the first-mentioned appliances for manipulating the link and pin, and where no change is required, the device can be applied to cars that are in for repairs, or at any time the officers see fit, without trouble. They may apply the devices to one or any number of cars, and send them all over the continent, and they will couple with any cars that are coupled with link and pin, and in place of being a nuisance, the cars fitted with the appliances can be utilized in coupling cars with which they connect. For instance, here is a train of fifty cars to couple, and every alternate car is provided with one of the devices in question: The whole train could be coupled by using the apparatus as easily as if every car was fitted with it. A company ordering new cars from custom shops, or building their own, can have the devices applied at a merely nominal expense, and when cars are undergoing repairs they can be applied with no trouble worth mentioning; and in this way all the cars in the country would be equipped with one of the best known coupling devices, at a cost but little if any in excess of what is annually paid for killing and injuring employés engaged in coupling.

It will be seen that there is a vast difference in the expense of equipping a road with the expensive automatic arrangements and these economical contrivances, to say nothing of the trouble attending the application of the

former, and the ease and comfort with which the latter can be applied; not forgetting that they will be regarded as welcome visitors on foreign roads, instead of nuisances, as is the case with the "automatics." This matter is worthy of the attention of every railway official in the country.

RECIPROCAL DUTIES OF RAILWAYS TO THEIR EMPLOYES.

BY ROBERT M. COOPER.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT is safe to assume that a railway employé who is content to perform his allotted duties in a mechanical manner and with a sort of half-hearted correctness will not rise very high in the world, nor experience any rapid advancement at the hands of his employers. It is likewise safe to assume that a railway company which simply pays its employés their wages and takes no further interest in their welfare, can hardly expect a very intelligent and zealous set of hands. There are reciprocal duties on the part of both the employers and the employed, and a proper regard paid to the interests of one by the other is invariably followed with increased prosperity to both. If for no other reason the performance of these reciprocal duties will prove a paying speculation.

It is a first and absolute requisite that the railway employé shall bring with him a high degree of natural intelligence, together with a thorough understanding of the duties to which he is allotted, and from an educational point of view he is grounded. However he may develop after his relations with the company have commenced, he is primarily the active force which produces the development; but unassisted he can do little, and unencouraged he can do positively nothing. It is the duty of the company to foster whatever latent energies he may possess and to develop his particular bent if he have any. Mechanical genius should not be tied down to dull routine work to an extent that will smother a desire to improve the methods employed, but taught to understand that the beneficial exercise of inventive gifts will not be unrewarded. No matter how humble may be the tasks allotted to an employé, nor how simple their nature, nor how meager his remuneration, the man should be allowed to see a ladder before him on which he may climb if he has the skill to make his opportunity and the pluck to grasp it. I would not give a copper for a precise reliable animated machine who does as he is told and never has a desire to do what he is not told in the hope of finding a better way of doing the same thing; and did circumstances compel me to accept a position upon a railway where I was told to do certain things in certain hours and always do them in certain ways, the exercise of the powers of invention being positively forbidden, I would eagerly seek for another situation. It costs a railway nothing to exert an educating influence over their employés, and the returns for this slight manifestation of interest in their behalf are ample.

It is cheerful to note the numerous libraries which the railway employés possess throughout the country, and equally gratifying to observe that the companies are taking a lively interest in their maintenance. In the promotion of these institutions much good may be accomplished, and in time it is to be hoped that they will go further than to furnish reading matter merely. The inducements for a hard-working man to spend his leisure hours in solitary reading are not great, and he naturally seeks a recreation which he may enjoy with others. The library as a library is a good thing, but far more good could be accomplished if, instead of mere reading rooms, the institutions were made lyceums in which talent was employed not merely to instruct but to interest as well. A series of lectures to railway employés would or could, I fancy, embrace a number of topics that could not fail to awaken interest and stimulate their energies toward improving their minds, and as an infallible consequence furthering their employers' interests. Train-hands especially, whose duties at best are rather dull; could be awakened to take pleasure in their labors by the development of their capabilities to act in the numerous emergencies which they are in constant likelihood of meeting, and also to take a lively interest in devising new methods for doing old tasks. It has frequently occurred to me for instance, that to no class of persons could the information be conveyed of the knowledge furnished by the lectures on "first aid to the injured" with more positive and beneficial results to the public at large than to train-hands in every capacity. Not a day passes that some one does not meet with injury on the thousands of miles of railway in our country, and frequently accidents occur far off from surgical assistance. Numerous lives could have been saved in times past had the train-hands at the time of accident possessed the knowledge of a few simple rules that would enable them to act intelligently and correctly in caring for the injured persons. Possibly the railway companies have already introduced instruction of this nature and if they have, it is a praiseworthy action on their part, as well as a duty they owe to both their patrons and their employés, unless they are prepared to furnish surgeons with every train after the manner of ocean steamships.

In spurring the natural desire for improved methods that is common to all men, railway companies can accomplish much. It is one thing for them to say: "This thing is to be done and it is to be done this way; you can hardly expect to suggest a better way." Doubtless the work will be well done but it will not be intelligently done; the railway will furnish the brains and the employé the hands. Better is it to say: "This work must be done, and we have always done it in this way. If you can suggest a better way your skill and inventive genius will be rewarded." I notice that a contributor to the JOURNAL for June says that British railway train-hands are more reliable as a rule than American though not so intelligent, and doubtless this is true; yet while reliability in employés is an admirable trait and indispensable to train-hands, too often is it obtained at the sacrifice of every natural desire and impulse to branch out and do a little original thinking. The American mind is, I think, naturally progressive. It matters little what station in life and what occupation a native American may fill; by heritage he is given an active mind and his capabilities should be given a fair chance. Possibly and even probably he may accomplish little in the way of practical results, but an entire subjection of his individuality to his wage-work will injure the former without benefiting the latter. By all means let railways give their employés a chance, if not to distinguish themselves at least to try, and this trial will test the value of

each man's services and ultimately relegate each to the position he is best qualified to fill. Let the companies demand reliability as the first requisite on the part of their employés, but let it be intelligent reliability and not the dull, unvarying accuracy of a machine.

Regarding the interest which railways should manifest in the morals of their employés there need be but little said, for self-interest alone is sufficient to prompt such action. It is absolutely necessary that their employés should be honest and steady, and for this reason the railways are forced to exert an influence which if not moral can at least be deemed admonitory. As far as exerting religious influence is concerned, the less they have to do in that direction the better, for from a strict biblical point of view railways are not shining exemplars and precept without example is not strikingly effective. Those few roads who abstain from running Sunday trains might with propriety look after the spiritual welfare of their employés but the vast majority of roads do run Sunday trains, and such a supervisory action would be a little inconsistent. It is to a mental and social influence that the railways should aspire and in exerting it they would find enough beneficent work on their hands without venturing in other fields.

Thus much for the railways' share of the reciprocal duties. They are not difficult of performance, nor would the experiment be costly, and I feel convinced that from a selfish standpoint, if from no other, the venture would be found to pay. But if the employers owe this attention and assistance to their employés the latter are not without obligations that are similar in the fact they are not called for in the bond. An employé is hired for certain definite duties and with their performance he too often ceases to exert himself. There is no feeling on his part that he owes an allegiance to the road which gives him a living, and he is generally inclined to regard his employers as natural enemies who await and seize every opportunity to harass and oppress him. As a natural result there is apt to be a mutual feeling of distrust between the two which manifests itself in strikes and uncalled-for disagreements between them. For my part I could never see the sense of this position which workmen are prone to take toward their employers. After family and national pride and fealty, it seems reasonable that loyalty to one's source of living comes as a natural sequence, but facts do not bear out the assertion. Capital and labor have for years been arrayed against each other and as usual in all unfriendly contests there is wrong on both sides. Railways doubtless employ as many if not more hands than any other industry if we take all the ramifications of the railway business into consideration, and for this reason this opposition is more manifest with railways than in other industries, for I do not think the railway employé is more unreasonable or contumacious than any other; but there is rarely an occasion when a little forbearance on both sides would not avert an open conflict. Fidelity on the part of a railway employé to the interest of his employers does not confine itself to attention to duty. It goes further than this and demands that no opportunity should be neglected by the employé to benefit his road, either by imparting desired information, by the rigid practice of economy when using railway materials, or by application to discover improved methods that will simplify the details of railway traffic. As I have said before the railways themselves are not given to encouraging originality or its development among its employés, but it should nevertheless be practiced until it demands recognition, and before arraying themselves against their roads, employés should not consider the extent of concession that the railways might be compelled to grant but rather the extent which they themselves are justified in demanding.

I live in hopes of seeing a glorious unanimity of spirit among railways and their employés, and a constant growth of intelligence among the latter. Just how this revolution is to begin is an open question, but if both the railways and the employés should each make up their minds that it is their place to make the first move it would be a wonderfully quick revolution. This much can be said with regard to the initial step: That the railways hold the key to the situation and there would be no room for the suggestion that their action toward the desired end was a deep-laid plan to ensnare their unwary employés.

LUBRICATING AND LUBRICANTS.

BY E. F. DIETERICHS.

[Written for the AMERICAN RAILROAD JOURNAL.]

VI.

ADAPTATIONS OF LUBRICANTS.

MANY intelligent and practical machinists cling to the old idea that one kind of oil should answer all the purposes in their shop, and hold to the use of lard oil exclusively. Lard oil is an excellent oil when of the best quality and pure; it is, however, very difficult at the present day to secure pure lard oil, as it is often manufactured of the vilest material and adulterated in endless proportions with cotton-seed oil, white and inodorous and much cheaper than the commonest grades of lard oil. It is also adulterated with so called mineral sperm oil which perverted ingenuity successfully and expressly manufactures for adulteration so perfect, that the uninformed are unable to notice its presence in the adulterated oils. There are also an endless number of mixtures of the lower grades of lard oil with all kinds of mineral oil for adulteration, and the less lard oil there is used in such mixtures the viler is the quality used to secure by its prominent odor a more ready sale for it. Cotton-seed oil is a very useful oil, but it belongs to the class of "drying oils," and like all of them is an inferior lubricant.

All the fatty oils decompose readily and leave gummy deposits which, with the dust in the shops and the abrasions from the metal, encumber the bearings and finally injure the machinery. Machinists are well aware of the inconvenience caused from the gumming of such oils on machinery not in constant use, and when hurriedly in need of using such, for instance a planer, are often delayed by the necessity of first cleaning and getting it into working order. There is a sufficient market for all animal and vegetable oils and all grades of mineral oils, and they should be employed for lubricating purposes only in accordance with their adaptations for that purpose. It is erroneous to expect one kind of oil, however good, to serve thoroughly and economically for all the manifold requirements in a factory or shop, and it needs not much observation to understand the fallacy of such a course.

Lubricating a cylinder and valves means lubricating in the presence of heat and moisture, and the lubricant, to be effective, should have greater consistency than a lubricant applied to machinery at ordinary temperature; and lighter machinery in rapid motion requires a more limpid and penetrating but, at the same time, tenacious lubricant than is needed for machinery of heavier weight and slow motion. Again, an oil used for lubricating running machinery effectually cannot be expected to do efficient duty for screw or thread cutting, drilling, etc., as the requirements in each case are widely different. The heating of bolts, pipes or screws and their dies, emanating from the frictional motion, is not so continuous as in the case of running machinery where the lubricants have to absorb and rapidly eradiate the heat evolved. In screw cutting, etc., the metallic surfaces are of very different density; their contact with each other is limited and constantly changed for new cool metal, so that ample time is afforded for the complete eradiation of the frictional heat and hence the heavy glutinous animal oils, with their superior heat-absorbing, but slow heat-eradiating power, are more efficient than the mineral oils which eradiate heat faster than any amount of glutinous or resinous matter mixed with them seems able to absorb. The watery preparations and emulsions intended to extend and lignify the lubricant for cutting small screws with rapid motion, stand in the same relation to the heavy oil used for cutting pipes and bolts, as the more liquid lubricant needed for lighter and fast running machinery to the heavy oils used to lubricate cylinders and heavy bearings; and neither is able to fulfill the duties of the other effectually and profitably.

It pays to use a good efficient oil expressly and intelligently manufactured for the lubricating of machinery and which can be obtained at less cost than reasonably good lard oil; and to keep separately for drilling and cutting purposes, a supply of some cheap quality of fatty oil. The economy and benefit from following such a course will soon outweigh the little inconvenience arising from keeping and using more than one kind of oil around the shop. Oils of tenacious lubricating power but of the greatest fluidity should be used on light and fast-running machinery; on engines and machinery with slower motion oils of greater consistency are necessary, and oils of still greater consistency should be used for lubricating cylinders and ponderous machinery, and heavy bearings.

All experienced mechanics and managers are well aware of these facts, and well know the advantage of using oils properly qualified to lubricate the different kinds of machinery.

(*To be continued.*)

FUTURE RAILWAY EARNINGS.

[From the *Railway Review.*]

THE present year has been a period of great uncertainty in railroad affairs, the earnings on many lines showing a large diminution as compared with last year's figures. The result of this reduction in revenue which has amounted generally to a larger percentage of the total amount than holds with any reduction of expenses, has been that a number of leading lines have been seriously crippled. Such have in some cases not only been obliged to pass their interest obligations, but have also failed in meeting their bills for supplies and amounts due for work performed by the employés. The consequence is that a new era of railway receiverships has set in, and while the list of roads thus taken out of the hands of their stockholders has not reached as high a number as in the years following 1873, yet the number is large enough to show that the condition of unremunerative operation is widespread. We do not pretend to deny the fact that the methods used in the construction of some roads have been such that the load of fixed expenses to be regularly met has reached such a volume that only the results of the most prosperous years would furnish revenue enough to meet them. In fact the disposition to discount the future has been too great on many lines, and one or two prosperous years are used as a basis for branching out in different directions and in ways that largely increase the regular expense to be met. Duller times following, find matters running upon a broad-gauge basis which cannot be immediately changed, and constriction and often disaster is the result.

Again, there may have been to a certain degree, extravagance in the management, thus using up the money which should have gone otherwise towards paying the regular fixed expenses. This condition of affairs we may consider as very seldom existing, and we may assume that the methods in use on all the leading lines to promote economy of operation, are up to the average of what is known of the art. The present condition of matters showing largely decreased revenues without equally decreased expenses, it is evident therefore that the net earnings, or the difference between what is gained for doing the business and the cost of doing the same, gradually becomes a smaller and smaller quantity. Upon this net revenue the whole strength and permanence of the railway system depends. The question, therefore, is how to prevent its further diminution.

This result may evidently be reached in two ways, for we may keep prices received for transportation fully up to their present rates, or we may, by greater economies and improved appliances, decrease the cost of doing the business, thus accomplishing the same result as regards net earnings. In general terms there does not seem any probability that the average rates for railway transportation will average higher in future years; and in fact the bulk of evidence points to gradually lowering rates hereafter, as has been the general rule for some years past. To this result everything in the railroad world tends. The increasing competition between the various roads themselves results in a constant movement in this direction and this natural reduction as it may be termed goes on in face of any attempts to reduce the loss by means of traffic agreements or pools. When we consider, also, the constant pressure brought to bear through the press, through public agitation, and through the oft repeated attempts at state and national legislation, it will be easy to see that if average railway rates even hold their own in the future they will be doing well. This being the state of affairs we can readily perceive that any future improvement is to come largely from reductions in operating expenses, and through constant aiming to make the cost of carrying freight or passengers decrease as far as possible in company with the gradual decline in earnings to which we have alluded before.

In this connection, therefore, it is well to examine into

the different classes of railway operation and analyze the component parts of each, seeing if possible when and where the same can be reduced. The main groups under which railway operating accounts are now generally divided may be stated as follows: Conducting Transportation; Maintenance of Way; Maintenance of Rolling Stock; General Expenses. Differences may occur on different roads as to the sub-accounts coming under each general heading, but the individual accounts we propose to examine are common to all roads, though under slightly varying names, and the results arrived at will be equally applicable to all.

Under the heading, conducting transportation, we find that one of the most important headings is train service. This includes the wages of all train-men with oil and supplies, as also the labor and expenses of cleaning out cars. In this account the chance of making material reductions seems quite small. Wages of train-men with other employés had a number of years ago reached their lowest notch, and prices at date are comparatively higher. The matter of increasing the length of trains beyond their present length would result in the employment of extra brakemen in order to control the train, and this would probably hold true even in case of the application of continuous brakes to freight trains. Material used for oiling cars and in operating trains probably cannot be reduced except by watchfulness in use. In wages of engine-men, it is probable that prices will never be materially lower than present figures, nor the number of men required to do a certain amount of work reduced. In materials used on the engines, such as fuel, oil and stores, there is yet room for improvement. In fact, in the fuel item seems to be the chance for the one largest single reduction that can be made. Comparisons for the last ten years go to show that the gain which has been made in the amount of load handled by one ton of coal is not in keeping with the saving in other items of expense. While better methods of using may be adopted, constant care and watchfulness will make the greatest saving.

In station expenses, but little can be gained at the ordinary stations, either in labor or material, except through detailed watching of individual expenses. At the larger and terminal stations we can probably reduce the cost of handling by improved methods of arrangement of depots, tracks and turn-tables, and the increased use of cranes and hoists.

The expense of traveling agents, solicitors and other foreign agencies come under the heading of conducting transportation, and though the complex nature of the traffic on our large lines will probably always render it necessary to spend money in this direction, the expenses should be kept within bounds so as to be in some degree commensurate with the amount of business that such men obtain. In the item of telegraphing it is probable that no vital reduction can be made as far as regards the movement of trains, for improved methods of moving and signalling, while perhaps making a saving through increased safety, will undoubtedly cost more to operate, thus partly balancing any gain elsewhere. The water system of our roads seems to be all that can be desired, the one chance of improvement being, perhaps, better methods of rendering the supply pure for locomotive use.

Under the heading, maintenance of rolling stock, we find the items of expense incurred in keeping engines, cars and machinery in good condition and up to the requirements of the road and the models of modern practice. One needed advance has lately been made in arranging for heavier car-loads so that there will be less dead weight to the ton of paying weight. There are doubtless improvements yet to be made in the working of steam in locomotives, as the present high-pressure system with the link motion seems nearly to have reached its highest development. The improvement of engine construction may be considered the second item in which a marked saving is possible. In repairs of engines and cars, improvments are being made from time to time, especially as regards the arrangement of shops and machinery. In car construction a saving is probably in the future from the further advance of the substitution of steel and iron for wood.

Maintenance of way comprises a large proportion of the total operating expenses. Here, though there is a gradual improvement in methods and in the substitution of more suitable materials than those which have been used, the total percentage of reduction to be made in the future will not probably be large. There are several items in which additional expense has to be incurred as a road grows, such as larger and more expensive buildings, more complex yard facilities and other matters which offset to a certain degree the savings made elsewhere. In general expenses there is probably no improvement to be made when compared with roads that are now economically managed. In fact it may be economy to increase the total amount spent under this head by employing such clerical force that the full details of the business, both of revenue and expense, may be fully understood by the management, thus giving a chance for comparison and improvement. In general terms it may be considered that of the whole operating expenses of an ordinary first-class line only twenty per cent. will cover those items in which there seem any prospect of a radical change for the better. In the remaining eighty per cent. there seems only room for such saving as careful and watchful management can control by cutting off unnecessary expenses. This possible reduction on any of our best managed lines is small. That comparatively little improvement has been made for the last few years will, we think, be shown from the fact that railway expenses as a general rule were higher in 1883 than in 1880, for doing a certain amount of work. This fact, together with that of a constant decrease in revenue for carrying the same amount of goods will doubtless emphasize the necessity of the closest and most economical management as the only chance for legitimate profit from railway property in the future.

SECOND-CLASS CARS.

[From the *National Car-Builder.*]

It is a question whether railroad managers in this country will not before many years be forced to consider the expediency of providing second-class cars for all passenger trains upon roads where the passenger traffic is at all heavy. The cars that compose these trains are public conveyances, and all sorts of people want to ride in them. It is for the interest of railroad companies to carry as many passengers as possible at rates that will afford a profit, and it is for the interest of the public to have the

rates as low as possible, and the profit derived therefrom distributed so that each class shall pay its fair and equitable share of it and no more. No matter how much we may ignore, theoretically or politically, the existence of class distinctions as something foreign to our system of government, they do exist nevertheless as rigorously and as unavoidably here as anywhere else, and in the relations of business they have got to be dealt with as such. Hitherto in our railroad practice these distinctions have been disregarded, there being no second or third class cars on our roads, in the meaning of these designations as applied to cars on European roads. Parlor and sleeping cars with us are special accommodations peculiarly American. Emigrant cars are for emigrants, and not for the great mass of people who would like to travel at less than the regular uniform rates, even if the cars were a little less luxurious and stylish. It may be said, then, that all passenger cars in our trains other than parlor and sleeping cars are first-class, and that every body who rides in them on purchased tickets is presumed to pay regular fare, or what would be first-class fare if there were any second-class. In view of this surface condition of things, it would be interesting to know just to what extent second-class tickets at reduced rates are sold over through routes, the buyers of them having free access to all the cars of a train except parlor and sleeping cars, and mixing themselves up among the mass of passengers who have paid the regular and higher fares. That a great deal of this kind of thing is done there can hardly be any doubt. That it is likely to increase seems highly probable, and the question is, how long and to what extent can this discrimination be practiced before it will culminate in the introduction of second-class cars in accordance with the system which prevails so extensively in Europe.

The official return of passenger traffic on thirteen leading English roads for the last half of 1883 showed that eighty-seven per cent. of the whole number of passengers carried was third-class, and that seventy-five per cent. of the revenue from passengers was derived from the same class. We notice also a recent statement covering four years of passenger traffic, ending in 1883, of the East Indian Railway, a line 1,500 miles long, showing a much larger preponderance of third-class passengers and revenue thence derived; but the character of the population in India, and the great difference in rates between first and third classes, are not a fair criterion, of course, for this country, or even for England; but the results are significant as to general conclusions. The steady growth of our manufacturing industries, especially at the South, together with the heavy emigration from abroad, are adding largely every year to the number of those who require second-class cars and cheaper fares, and if these are a necessity in Europe, as they certainly seem to be; if they are an indispensable convenience to the population there, and a prolific source of revenue to the roads, why should they not become so here under the same or similar conditions?

We do not wish to be understood as favoring the introduction of class cars so long as it is cheaper for the roads to carry all passengers in one class of cars, as they are now doing. We would only suggest whether the time is not coming when it will pay the roads to enable people to classify themselves to a greater extent than they can now, by providing a class of cars at lower rates. To have two kinds of cars in every train where there is now but one kind, exclusive of parlor and sleeping cars, would of course increase complication and cost, and unless the increase of earnings from second-class travel would more than cover the increased cost, the change would be of no advantage to the roads, whatever it might be to the public. Assuming, however, that second-class fares would cover the increased cost, it may be asked whether, with the increase of that class of our population who are not sensitive about traveling second-class, a state of things is to be continued always which throws people together promiscuously when they would prefer to sort themselves so far as they can do so on the basis of a difference in fares. Class cars and fares would not of course make everything congenial by separating the vulgar from the refined, or the unsavory from the clean, nor would the rooted prejudice against class distinction be at once overcome. Many people who for economy's sake would prefer to travel in second-class cars, would at first go in the first-class for the name of the thing, even if they traveled less in order to afford it. They would feel reluctant to make an exhibition of their poverty even to strangers, although their dress and baggage might indicate it almost as well as the getting in or out of a second-class car. But this sensitiveness would be felt less keenly by familiarity with the custom, and would finally be overcome and laughed at.

There is another branch of this subject that has already attracted some attention in Europe, and which is, that the carrying of first-class passengers at the existing rates brings little or no profit to the roads. If there is any profit from this source on European roads it is in the aggregate quite inconsiderable as compared with the profit derived from third-class passengers, the entire receipts from the first-class amounting to only a small percentage of the total receipts from the third-class. This confirms us in the opinion that if all the elements of expense that are involved in the running of parlor and sleeping cars in this country could be correctly ascertained, it would be found that travelers in these cars contribute much less to the profits of the railroad companies than the people who travel in ordinary coaches.

ELECTRICITY AS A MOTOR.

[From the New York *Sun*.]

THE interest aroused by the trial the other day of the Cleveland Electric Street Railroad, the first put into operation for city passenger travel in America, is natural, and the degree of success claimed for it is not surprising. Nearly a year ago electric cars were moved through the crowded thoroughfares of Paris by the Power Storage Company of that city at the rate of nine miles an hour on a level and of more than five on an ascent. A distance of thirty miles was accomplished by moving the car from one route to another in the French capital, often across several yards of trackless ground, and without accident or difficulty of any kind. The locomotion was effected by Faure-Sellon-Volckmar accumulators, fixed under the seats, and connected with a Siemens machine beneath the floor. Last November we had the less successful preliminary trials of the Daft motor on a Saratoga railroad.

The electric railway in Vienna dates back to the Electric Exhibition there, when a mile in three minutes was regularly made by the train. At Berlin the high level

railway was at the same time operated by electricity. The small electric railway at Portrush derived interest from seeking its energy in a neighboring waterfall; while the invention of Desprez for transporting electrical force to great distances has been applied to a waterfall near Grenoble, which has worked, to the extent of seven-horse power, a printing press, a sand mill, and other machinery.

An electrical omnibus, also, has been tried with success in Paris, during the busiest hours of the day, and the heavy vehicle was handled and turned with facility. In some of the coal mines of Saxony electricity has for many months been employed, not only to draw trains of coal, but also to work a ventilating fan. Even a thermo-electric stove has been invented, as have also electric lights that can be used on railway cars, in spite of the vibrations and frequent shocks to which trains are exposed.

On the water, electricity as a motor has made no less rapid progress than on land. Last summer an electric boat was plying on the Danube Canal, taking thirty or more passengers six miles an hour against the strong current and eighteen miles an hour with the stream. Two years ago a launch propelled by electricity was shown on the Thames, and the following year a boat of that character, forty feet long, attained a speed of eight miles an hour on the measured mile—this boat being the one, we believe, already spoken of as used on the Danube. Its trips were accomplished, of course, without smoke, or heat, or smell of oil, and also without noise of engines or vibration. As for the application of electricity to submarine torpedoes, it is now the subject of much study, attended with some success. Electric small arms have already been invented, and one such weapon was operated not long ago by Col. Fosbery at London, before an assembly of army officers and others, by means of a small accumulator secreted under his waistcoat. The gun was the invention of Pieper of Liege, who has fired more than a hundred rounds with it in two minutes. We may yet see electricity revolutionizing the manufacture of small arms.

But there is special interest attaching to the use of electricity in transportation, because here an enormous element in modern life, affecting great populations at all times, is dealt with. Of course the matter must still be viewed as experimental, since only protracted tests fully determine those considerations of economy, convenience, and safety on which ultimate success depends. It is certainly noteworthy, however, that while various new motors, such as caloric, compressed air, coiled springs, and grip cables, have been under contemplation and trial for so many years as possible substitutes for horses in street railways, electricity has suddenly come to the front, threatening to supersede them all.

Consumption of Railway Ties.

ACCORDING to a recent number of the *Wood-Worker*, there are now fully 148,000 miles of railroad track in the United States, and therefore about 391,000,000 ties, and the average consumption for renewals should be about 56,000,000, or the product of 560,000 acres of land, at 100 ties per acre, requiring 126,800,000 acres or 26,000 square miles, equal to less than half the area of Michigan or Wisconsin, two-thirds the area of Maine, and a little more than half the area of North Carolina, if, as reported, it takes thirty years to grow tie timber.

Mr. Hicks says that the reports to the Forestry Department show that it takes thirty years to grow timber large enough for ties, and that the product is about 100 ties per acre, while the average cost of ties to the railroads is thirty-five cents. This is a product worth $35, as the return of an acre for thirty years. If this is all, then with money at five per cent., no cost of cultivation and no taxes, it will pay to grow ties on land already wooded worth $8 per acre, and on land worth $7 per acre if interest is six per cent.

If 113.3 acres of woodland are required to maintain the ties of every mile of railroad, the question with the railroads, says the *Railroad Gazette*, is not simply whether they should produce their own ties, but also whether they may not profitably diminish their consumption. The experience of Germany indicates that an average life nearly three times as long can be had by preserving the ties with chloride of zinc, or creosoting (so called, for there is usually little or no creosote in the oil used). But even if the product of fifty-six acres per mile is required, it does not follow that the only escape from a famine will be the cultivation of timber. If land planted or stocked naturally with the trees which will make 100 ties in thirty years is worth $20 an acre—and in many parts of the country it is worth as much as that—at the end of thirty years required to grow the trees it will represent, with interest at six per cent., $118, and with interest at five per cent., $88; and if then the land after the ties are cut is still worth $20 an acre, the 100 ties, before cutting, will have cost $98 in the one case and $68 in the other. But the taxes meanwhile would probably have cost $50 or $60 more, and there would be some expenditure for care. If then the land is not cheaper than $20 per acre, the railroads will probably do better to depend upon some metallic substitute than to grow tie timber, even if it gets fourteen years' life out of a tie.

Royalty on English Railways.

THE Prince of Wales recently delivered an address before the Railway Guards' Universal Friendly Society, of London, in which he said:

"I find that there is no return given which will show the number of trains run in any one day by all the railway companies in the kingdom, but I have been able to ascertain one or two facts which may prove of interest. At Watford Junction, on the London and Northwestern Railway, 333 trains pass through that station every day. This gives something like one in every four minutes of the twenty-four hours. At Cannon Street Station on the Southeastern Line, the number of trains using the station is 750 in one day. I also find that at the Clapham Junction the London and Southwestern Railway had, in the year 1877, on an ordinary week-day, 656 trains; while on the Derby day of 1876 no less than 1,023 trains passed through this junction. These numbers do not include the trains of the London, Brighton and South Coast Railway, which also use the junction. The total number of passengers conveyed in 1883, exclusive of season ticket holders, was: First class, 36,387,877; second class, 66,096,784; third class, 581,233,476; total, 683,718,137; add season ticket holders, 180,000,000; total, 863,718,137. Of minerals there were conveyed 189,485,612 tons; of general merchandise, 76,897,356 tons; number of miles run by passenger trains,

139,545,464; number of miles run by goods and mineral trains, 129,351,774; total miles run, 268,897,238; miles of railways, 18,668; number of persons employed, 367,660. It is worthy of note that all the men employed on railways are amenable only to the general laws of the country, and that the marvelous discipline which exists among them is kept up without any special powers. In order to show the great progress that has been made toward the safe working of railways, I may mention the following figures, taken from the returns of the Board of Trade. Thirty-five years ago the ratio of passengers killed in the United Kingdom from causes beyond their own control was one in 4,782,000, while last year it was one in 61,810,000. In 1883 only eleven persons were killed from causes beyond their own control. This fact speaks in a most unmistakable manner of the admirable management now exercised in the working of railways, and is a strong confirmation of the saying that a railway train is the safest place in the world. As compared with this upward of 200 persons are annually killed in the streets of London. The Board of Trade returns show some curious statistics. In 1883 there were sixty-one suicides on the railways. Not a single passenger was killed from a cause beyond his own control in England. Two hundred and ninety-three persons were killed trespassing on the lines of railways, and, during 1883, 40 horses, 59 beasts and cows, 110 sheep, 4 donkeys and 1 deer were run over and killed."

A Trip on a Fast Locomotive.

HAVING occasion lately to pass over some branches of the Philadelphia and Reading Railroad, a permit to ride upon the locomotives gave me opportunity to observe some striking points as to their work and wear.

At Bound Brook the Philadelphia and Reading Railroad joins the Central of New Jersey, forming the Bound Brook line between Philadelphia and New York. South of that point Wootten locomotives are used on fast trains. North of it, standard Baldwins. The train leaving Philadelphia at 7.30 A. M., engine 364, makes the run to Jersey City in one hour and fifty minutes, schedule time, including some eight or ten stops and "slow-ups." A stretch of seventeen miles between Princeton Junction and Bound Brook, including two slow-ups and one stop, was run in exactly seventeen minutes. Of these seventeen miles, eleven in succession were run in nine minutes and ten seconds, being a rate of seventy-two miles per hour. And of these eleven, two successive miles were run in forty-seven seconds each, being a rate of 76.6 miles per hour. This was the regular daily run; we were not behind nor making up time.

Even at these high speeds the engine ran about as smoothly as a first-class car. I have many times experienced severer vertical and lateral oscillations in such a car on reputable roads at forty-five miles per hour. So smooth, indeed, was the run, that instead of any nervousness as to the safety of such speeds, the query constantly suggested was: Why may not a higher speed be obtained with entire safety? Or is there anything to prevent it but the problem of making the requisite steam?

In fact, safety at high speeds is aimed at in these engines, oddly enough, by placing the center of gravity very high—perilously high it at first appears; but when it is considered that the higher the inclination of the lines from the center to the rails, within the limit of safety from capsizing, the more lateral shocks will be eased by the springs, then it ceases to be a wonder that lateral oscillations are so little felt, for the reason that as sudden shocks they cease to exist. And take away the sudden heavy impact of the flange of the wheel laterally against the rail, and the danger of the wheel climbing the rail is taken away.

The firing and steaming of these engines is to be noted also, as they are the prime condition of the high speeds. The fire box is placed above the level of the top of the drivers, and extending out the full width of the engine, overhangs them. An immense grate surface is thus obtained. Water tubes traverse the mass of fuel fore and aft, promoting circulation. The crown-sheet is separated from the fire-box by a wall of fire-brick rising above the level of the fuel, and by a hot air or flame chamber between it and the fire-brick. The crown-sheet holds the largest number of the smallest brass tubes I ever saw in a locomotive boiler.

The force of the blast being expended through so broad an area of fuel, the velocity of the air current through it is reduced, and as a result, but very little cinder, and that the finest, is ever drawn through the tubes. True, a spark-arrester is placed in the smoke-box—to comply with the law—but it arrests nothing, for nothing coarse enough to be arrested by it passes through the tubes; in other words, the stuff is all burned up in the fire-box. The fact that these boilers are able to utilize what is known as "buckwheat" size coal, making steam very feebly with it, is a strong point in their favor.

Notwithstanding the rapid evaporation effected—as high as forty-seven gallons per minute—they are not flighty. In the entire run above referred to the gauge did not vary three pounds from 135, due in part, perhaps, to an occasional blow-off, while slowing in to the water-tank.

On the return from New York, I rode to Bound Brook on a Baldwin engine, No. 165, having a remarkable record, viz., that of having run 119,360 miles consecutively, without any general repairs, her weight not having once been lifted from her drivers in that period.—*Cor. Scientific American.*

A Long Railway Journey.

DR. DAVID GILL, the astronomer at the Cape of Good Hope, thus illustrates the distance from the earth to a fixed star, Centauri. "We are a commercial people; we like to make our estimates in pounds sterling. We shall suppose that some wealthy directors have failed in getting Parliamentary sanction to cut a sub-Atlantic tunnel to America, and so for want of some other outlet for their energy and capital they construct a railway to Centauri. We shall neglect for the present the engineering difficulties—a mere detail—and suppose them overcome and the railway open for traffic. We shall go further, and suppose that the directors have found the construction of such a railway to have been peculiarly easy, and that the proprietors of interstellar space had not been exorbitant in their terms for right of way. Therefore, with a view to encourage traffic, the directors had made the fares exceedingly moderate, viz., first-class at one penny per 100 miles. Desiring to take advantage of these facilities, an Ameri-

can gentleman by way of providing himself with small change for the journey, buys up the national debt of England and of a few other countries, and presenting himself at the booking-office, demands a first-class single to Centauri. For this he tenders in payment the scrip of the national debt of England, which just covers the cost of his ticket; but I should explain that at this time the national debt from little wars, coupled with some unremunerative government investments in landed property, had run up the national debt from 3,500 millions to 5,500 million dollars. Having taken his seat, it occurs to him to ask 'At what rate do you travel?' 'Sixty miles an hour, sir, including stoppages,' is the answer. 'Then when shall we reach Centauri?' 'In 48,663,000 years, sir.' 'Humph! rather a long journey.'"

The Longest Bridges in the World.

A LATE number of the *Moniteur Industrial* gives the following as a list of the twenty-six largest bridges in the world:

	Lineal feet.
Montreal Bridge over the St. Lawrence	8,791
Brooklyn, over the East River	5,989
Rapperswyl, Lake Zurich	5,333
Volga, over the Sysran, Russia	4,947
Moerdyck, Holland	4,927
Dnieper, near Jekaterinoslaw, Russia	4,213
Kiew, over the Dnieper	3,607
Barrage-bridge, delta of the Nile	3,353
Kronprinz Rudolph, over the Danube at Vienna	3,266
Dnieper, near Krementchoug, Russia	3,250
Bommel, over the Meuse, Holland	3,060
Two bridges of Rotterdam, over Meuse	2,833
Mississippi Bridge (?)	2,588
St. Louis, over the Mississippi	2,574
Saint Esprit, over the Rhone, France	2,460
Kiulinbourg, over the Rhine, Holland	2,347
Cincinnati, over the Ohio	2,233
Chaumont Viaduct, valley of the Suize, France	2,000
Menai, England	1,956
Cubzac, over the Dordogne	1,817
Varsovie, over the Vistula	1,693
Iron-bridge at Bordeaux, over the Garonne	1,667
Stone-bridge, at Bordeaux, over the Garonne	1,623
Beaucaire, over the Rhone	1,460
Tours, over the Loire	1,457
Alexandre, at St. Petersburg	1,350

Of the above, the sixth on the list has just been opened; the Rapperswyl bridge is merely a pile structure and is only thirteen feet wide; the Sysran bridge over the Volga, carries the Orenburg railway, and was only finished in 1880; it has thirteen spans, and is raised 131 feet above the level of the river; it cost 13,000,000 francs ($2,700,000).

The Moerdyck bridge carries the Anvers and Rotterdam railways over the Meuse, which is about 8,800 feet wide at this point, and has been reduced by dykes; it has fourteen spans of 328 feet each. It was commenced in 1868 and finished in 1871; it cost about 12,000,000 francs ($2,400,000).

The above list is given as printed, but the compiler in the *Moniteur* has in his table wholly ignored many of our long American bridges. A complete list of the length of modern iron bridges is not just now accessible, but among the omissions may be noted:

	Lineal feet.
The Baltimore and Ohio bridge, at Havre de Grace (being built)	6,000
Wooden bridge at Columbia, Pa	5,366
Louisville Railroad bridge, over the Ohio	5,218
Cincinnati Southern Railroad, over Ohio	3,950
Havre de Grace bridge, over Susquehanna	3,271
Dauphin bridge, over Susquehanna	3,590
Monongahela bridge, near Homestead	5,300
Plattsmouth bridge, over Missouri	3,000
Quincy bridge, over Mississippi	2,847
Omaha bridge, over Missouri	2,750
Keokuk, Iowa, over Mississippi	2,008
La Crosse bridge, over Mississippi	1,672
Booneville bridge, over Missouri	1,651

To the above many other long bridges could doubtless be added, were the data at hand. The longest bridge in the world was the late Tay bridge, which was 10,320 feet in length, and the Forth bridge now under construction is to be about 9,200 feet long. Although it does not strictly belong to the class in question, the New York elevated railroad is really a continuous iron truss bridge, and the aggregate length is thirty miles.—*Engineering News.*

Railway Receivers as Rate Destroyers.

ON what principle of law, equity or common sense is the receiver of a bankrupt railway justified in permitting the road to cut rates and engage in a rate-war with competing lines? The receiver is an officer of the court and in the eye of the law can do only what is ordered by the court. It is the court, therefore, which originates and controls the policy of the road and is responsible for its management. But what right has a court of equity to permit its representatives and servants to engage in a contest which almost always involves the violation of express agreements with other lines, and always lessens the net earnings of the property which is in the hands of the judge as a sacred trust? Is it not most unnatural—is it not monstrous that a court should permit such a policy to be carried out? The legal tribunal obtains control of the railway because it—the corporation—is weak. Its business has not been sufficient to enable it to meet its obligations. It has been defeated in its attempt to establish itself among its rivals and has been put into the hospital, wounded and sick. How can the court to which this damaged and failing property is committed be justified in permitting it to reach out from the safe covert of legal protection from creditors and work mischief to those whose competition it has been, of itself, unable to meet?

The usual reason given for rate wars is that they are entered into to secure some right or advantage in the future to which the road which begins the contest believes itself entitled. But a railway corporation which has become bankrupt and has fallen into the arms of the court has no future. Before it can again enjoy an independent life the property must almost invariably pass into the hands of another corporation, and become a new enterprise. But certainly the court has no right to work for the interests of this new company. It has no right to adopt a certain policy because it may be of advantage to the corporation which, at some time in the future, is to purchase and manage the property.

It is the duty of the court to make the property yield all that it possibly can to the creditors, and to satisfy their claims by foreclosure and sale as quickly as practicable. The operation of a bankrupt railway by the court is merely incident to its jurisdiction, and is justified only by the probable benefit which will result to the creditors therefrom and by the accommodation which the running of the road gives to the public. But to authorize a rate war is damaging to the interests of the creditors. It is injurious to the public also, because it is now admitted that steady, rather than excessively cheap, rates are most desirable.

Then, too, the court which permits the road in its control to reduce rates below a reasonably profitable standard is robbing the shareholders of the other lines which are affected by such reduction. It is helping competitive railways to become bankrupt and go into the hands of receivers. Surely it is not within the proper scope of a

court of justice thus to make business for itself in the future!

From every point of view it appears that for a court to permit the railway which it operates through a receiver to cut rates is altogether inexcusable. That the judge has authority to prevent such a course needs no argument. And to insist that the road for whose management he is responsible shall not be an element of disturbance and loss to other lines is the plain duty of every chancellor who is called upon to settle the affairs of a bankrupt railway corporation. That a railway which has been unable to stand alone should be permitted by a court of equity to become strong for mischief because it is weak in other respects is simply outrageous.—*Railway Age.*

Railway Progress in Russia.

RUSSIA has raised a loan of fifteen millions sterling for railway purposes. As far as can be ascertained this sum has already been half expended, and the other half is intended for carrying out long projected works, such as the extension towards Siberia by the Tumen line, the opening up of the Donety coal district, the Kresie wrought iron district, the Bashkunchasky salt district, etc. But, it is said, to put all the Russian railways now lingering for funds into a proper position would require, at least, another such loan. At the present time the whole length of railways open in Russia is 22,211 versts, and adding 1,107 versts in Finland, and 217 on the eastern side of the Caspian, there is thus only 23,535 versts, or 16,000 miles of railway in the vast Russian empire.

English Railway Rolling Stock.

ENGLISH railway rolling stock works are nearly all busy, and a large number of the orders are for iron framework for cars to be built abroad. A contract for 1,400 freight-cars for the Western Railway of Buenos Ayres, is just now being executed by Messrs. Brown, Marshall & Co., of Birmingham. The whole of the frames are of wrought iron. Half the number are covered freight-cars, and in these the frame-work is of angle and T iron of Staffordshire make. The firm is also executing another contract for South America for 230 covered freight-cars, the frames of which are likewise of iron. In their passenger-car department they have three other contracts on at present for cars with iron frames for shipment. This pattern of frame is becoming almost universally adopted for all foreign orders, and appears to be more suitable for hot climates than timber.

A Wonderful Underground Railway.

THE London Inner Circle Railroad is a marvellous feat of engineering skill. It runs throughout its entire distance under the busiest center of the largest city in the world, and the operations attending the excavation and construction have proceeded without serious injury to or interruption of business or traffic. Quicksands have had to be passed through, beds of old rivers spanned, lofty warehouses and massive buildings secured while their foundations have been undermined, and an intricate network of gas and water pipes sustained until supports had been applied to them from below. Added to this, the six main sewers had several times to be reconstructed. Day and night the work has been carried on for eighteen months, and now the engineers are able to announce that their tunnel is complete. The laying of the rails and the building of the stations are the only portion of the immense work that remains to be done, and in a very short time trains will be passing over the whole of this wonderful subterranean road.

Two Destructive Fires.

ON the night of Monday, Aug. 4th, there were two fires that in the aggregate caused a loss of nearly half a million dollars—the destruction of the Ferry House of the Pennsylvania Railroad at Jersey City and of the Baldwin Locomotive Works at Philadelphia. The latter loss will prove the more serious in its effects, since many valuable patterns were destroyed that will be very difficult to replace, together with much valuable machinery. The loss in each case is estimated from $250,000 upward.

Bog Peat as Fuel.

THE bog peat of Mexico is now being used on a considerable scale as fuel for locomotives, stationary engines, smelting purposes, smiths' fires, and household use. The peat is mixed with a proper proportion of bitumen, and is said not only to burn freely, and without smoke in much quantity, but to give a higher dynamic equivalent of heat than the same amount of wood.

THE expedition to Hudson's Straits, recently mentioned by telegraph, is not under British auspices, but has been undertaken by order of the Canadian Government to determine the feasibility of Hudson Bay navigation, upon the establishing of which fact depends the construction of a railway from Winnipeg to Hudson Bay. This railway is designed to transport the wheat of the Northwest, and, if Hudson Bay is navigable for a considerable portion of the year, it will shorten the line to Europe from the Northwest very materially. The British Government refused to assist in establishing observation stations in Hudson Bay.

CHINA has evidently taken a new departure, if the statement is correct that the Government has ordered a railway to be made from Pekin to Tien-Tsin. The decision marks a wonderful change of policy from that in favor not many years ago, when the Government bought the Woosung line in order to tear it up. When eighty miles of railway are made in China, it will hardly be long before there are 8,000.

GERMAN engineers are now engaged in removing the foundations of an old bridge built by Charlemagne in the eighth century. The wood of the piles, used in its construction, although nearly 1,100 years old, is so well preserved that it can still be used in building. The iron, which was riveted to the posts, can also be used, since it is covered only with a thin layer of rust.

A LAW passed by the New Jersey Legislature at its recent session authorizes the use of electric or pneumatic train signals of approved pattern in the place of the bell-cord, the use of which on all trains is now required by law.

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A FURTHER REMINDER.

THE railway world is furnished with papers devoted to the publication of railway news, and there are also periodicals maintaining the discussion of matters of railway construction, management and finance, while mechanical papers make a specialty of railway inventions and mechanics. The AMERICAN RAILROAD JOURNAL stands alone in being a monthly railway magazine and review containing original and selected articles on matters of contemporaneous interest to railway and tramway officials, managers, mechanics and employés generally; and as such it deserves the united support of all who deem such a publication desirable. We have received a number of letters expressing satisfaction with the subjects and treatment of the contributions which have lately appeared in the columns of the JOURNAL together with hopes that they will be continued; and once again we announce our intention to publish several original papers in every number so long as they meet with general favor. The invitation extended to our readers last month to contribute articles to our columns is cordially reiterated with the assurance that every accepted article will be liberally paid for upon publication.

AN IMPORTANT DECISION.

THE recent decision rendered in the Court of Common Pleas in this city by Judge VAN HOESEN, in the matter of CHAS. F. MATTLAGE against the New York Elevated Railway Company and the Manhattan Railway Company, possesses a more direct bearing upon the interests of the elevated roads than any that has yet come to our notice; and if his decision is sustained by the higher courts no end of litigation may ensue. The plaintiff in the case is the owner of a building on the Southwest corner of Greenwich and Warren streets, in which he conducts the business of a dealer in provisions. He applied to the court that the railway companies in question should be enjoined from maintaining a station at the junction of these two streets, and if this relief should be denied him, that he should be awarded compensation for the injuries which the continuance of the station has caused and will cause him. Judge VAN HOESEN has ruled squarely in his favor, judgment with costs being awarded the plaintiff; and while we are in no sympathy with the rabid and unreasonable attacks which railway corporations are compelled to resist in the courts, we are forced to regard Judge VAN HOESEN'S decision a strong one in which his position is borne out by the facts in the case.

Quoting that portion of the laws of 1867 which conferred the necessary rights upon the New York Elevated Railway Company to construct and operate their road, he showed that the company was only empowered to run

through certain designated streets, and that three commissioners were appointed who should have power to remove obstructions and designate the points at which staircases should be erected to give access to the elevated structure; but that the power to construct the road did not include the right to occupy the highways with stations, this being clearly shown in the clause which expressly provides that the company may "rent, purchase or acquire such buildings or parts of buildings as may be convenient for the stations or depots for public access to the railway." Thus, the Judge argues, the legislature did not contemplate the erection of the stations in their present form, nor does he see the necessity for such erection. Under these circumstances he decides the station in question to be at present maintained without the authority of law and therefore a purpresture, or encroachment.

To the granting of the injunction the defendants raised several objections which were overruled by the court. They claimed that while the plaintiff's chief cause for action lay in the fact that the elevated station obscured his light, he himself maintained a wooden awning over the sidewalk which caused the same result. The Judge ruled, and justly we think, that it is clear that by building a shelter from the sun a man does not deprive himself of his right to complain of an unlawful structure that darkens his windows, and that if a man fails to make full use at all times of the light that the sun would give him, he thereby does not place himself at the mercy of anyone who chooses to obscure his light. Another objection made by the defendants to the granting of the petition was that the light in question was reflected light and that the station did not directly obscure the plaintiff's windows. This point the Judge dismissed as technical and very properly ruled that the question at issue was whether the plaintiff was unlawfully deprived of light by the maintenance of the station regardless of the manner of the deprivation.

Upon reading the decision we are somewhat surprised that the matter has not been brought into litigation before, and are forced to admit that the elevated railways have received a very effective blow. Either there must have been considerable looseness in drawing up their charters in not providing for the vital question of stations, or the question was purposely left in abeyance with the understanding that the companies would buy or acquire property for their stations at points on their roads after the manner of surface roads. If this latter supposition be correct it is amazing that the stations should have been built without objection being raised; and if Judge VAN HOESEN'S view be sustained by the higher courts, the tardiness of the action will not prevent the elevated roads from being seriously involved with countless suits of the same nature. They might take time by the forelock and introduce a bill in the legislature that would relieve them from their present embarrassment, but they would be confronted with the unpleasant fact that no concession would in all probability be granted them without the coincident passage of another Five-Cent Fare bill, and thus they would be between two horns of a dilemma. That the stations of the elevated roads are far more convenient to the traveling public in their present situation than they would be were they placed in or on buildings in the middle of blocks, is unquestioned, and we should heartily regret their removal. That this removal would be strongly opposed by nine-tenths of the property owners whose property is situated adjacent to the present stations is equally probable, for the latter sensibly perceive that their business is aided by proximity to such important centers of travel; but this does not appear to us to mend matters when Judge VAN HOESEN'S decision is regarded in its full breadth and cogency. There is the law, and it has been interpreted as contrary to the maintenance of the present elevated railway stations. It is difficult to predict the course affairs will take relative to their removal, but doubtless the companies will not submit without a further struggle, and the progress of the case, if it be appealed, will be watched with absorbing interest.

FIRE-PROOF RAILWAY FERRY-HOUSES.

THE destruction by fire a few days since of the extensive ferry-house and railway buildings of the Pennsylvania Railroad at their eastern terminus in Jersey City is an instance of the flimsy construction which is common in such structures. In a few minutes after the fire first broke out the premises were wrapped in flames, and in an incredibly short time damage was created to the extent of from $250,000 to $350,000. The buildings were a mixture of old and new and while fairly creditable in appearance, were mere shells in which there were no precautions taken to insure safety in case of fire. As far as known the conflagration was caused by an explosion of gas, and it is stated that there had been an odor of escaping gas about the premises for several days, but there is no evidence to show that this fact was taken as a warning nor that special pains were taken to discover and remedy the leakage. The Pennsylvania road is not the only road possessing ferry-houses and adjoining buildings of the tinder-box construction, and it is noticeable that nearly all such buildings seem to present an appearance of instability and inflammability that naturally cause strangers to regard them as temporary structures. In fact the destroyed buildings of the Pennsylvania were among the best of their class and if they were so perilously fragile and destructible, what may be looked for in the others? Beginning at Communipaw and working up the North River on the Jersey shore, it will be seen that none of the railway

termini have stations and attendant ferry-houses that possess the slightest claims to be deemed fire-proof structures. The buildings of the New Jersey Central road at Communipaw are flimsy wooden sheds that in a strong wind would be consumed by fire in half an hour if the slightest headway were given, and but a few months ago they were perilously nigh burned by the destruction of the adjacent freight-sheds. The Pennsylvania buildings came next and were a considerable improvement, yet they are now a smouldering heap of ashes. The buildings of the Erie road, next above, at Pavonia, are comparatively new, having been rebuilt after the fire of 1873 which of course totally destroyed the former buildings, but the present structures are as usual of the flimsiest construction and would suffer total demolition if a fire should break out in a remote corner and gain a trifling headway before discovery. The ferry-house adjoining the terminus of the Delaware, Lackawanna and Western road, at Hoboken, is conspicuous for being the handsomest structure of the kind on the river-front, but it is built of light woods and decorated with ornamental wood-work in a manner that would insure its speedy conflagration should the slightest chance be presented, while the railway sheds in the rear are of the most barn-like and primitive construction. As the railway does not own the ferry there may be some excuse in this case for the temporary and cheaply constructed sheds, but there is fault somewhere.

Thus it will be seen that of the four main railway lines terminating at the Jersey shore immediately opposite New York City, not one possesses terminal buildings and ferry-houses that are not in constant peril of destruction by fire, and that two of the roads, the Erie and the Pennsylvania, have met with this misfortune within a dozen years while the New Jersey Central has narrowly escaped a similar catastrophe in the same period; yet there has been no improvement manifested in the character of the buildings with reference to their fire-proof construction. In the case of the Pennsylvania road the buildings were not insured, the company preferring to carry their own risks rather than obtain outside insurance, so that the loss is an individual loss with which the road is alone concerned; but the surrounding buildings have a direct interest in the stability of the extensive structures that the road has reared, and in rebuilding them we trust that improvements will be introduced tending to diminish the chances of a disastrous conflagration. The Pennsylvania has shown much energy in maintaining its traffic and running trains upon schedule time despite the destruction of the buildings necessary to a proper conduct of its business, and we are not surprised that this progressive road has determined to rebuild the burnt structures at once; but we hope that this statement does not mean that the new buildings will be duplicates of the old. It strikes us that durable buildings of iron with as little wood as possible in their construction are best suited for the purposes of railway sheds and ferry-houses, and doubtless the public would pardon a little delay on the part of the road if the intervening time be spent in the perfection of architectural plans for new structures that will combine comeliness and durability with fire-proof qualities, and thus establish a new era in buildings of the kind.

The Pennsylvania road has been foremost in nearly every beneficial innovation which the railway companies have introduced at their termini in or near this city, and it has frequently set examples that met with prompt adoption by other roads. The opportunity is now afforded the Pennsylvania once more to take the lead in constructing a fire-proof ferry-house with adjoining stations, and notwithstanding the laudable desire on the part of its managers to repair the damage caused as quickly as possible, we believe their good sense will prompt them at the same time to guard against like contingencies in the future by remedying the architectural defects which were primarily the cause of the recent disaster.

OCEAN RACING.

THE present year will be conspicuous in the annals of ocean navigation for the sharp rivalry manifested by the trans-Atlantic steamer lines for supremacy in the question of speed, and certain it is that the passages now made by new vessels of several of the companies are remarkable, and in strong contrast to those of a few years ago, when an eight days' passage was considered as quick time. This record has been steadily beaten and the time of passage diminished until the "crack" boats are expected to cross the Atlantic in considerably less than seven days. The Guion line was the first to equip vessels with especial reference to their speed, and its example was quickly followed by the Anchor and National lines, until finally the staid and conservative Cunard line abandoned its rather musty policy which had been maintained for many years and entered into the rivalry with astonishing vim. At present the champion boats are the *Alaska* of the Guion line, the *City of Rome* and the *Austral* of the Anchor, the *America* of the National, and the *Aurania* and *Oregon* of the Cunard; the latter vessel having been purchased from the Guion line after it had achieved the fastest record. All of these steamers are new and superbly appointed, being furnished with the latest approved devices for the comfort and convenience of passengers, and their speed-records are so slight in variation that it is difficult to pronounce judgment as to which is in reality the fastest boat. The best record may be beaten any day by any of the above-named vessels and in time we may confidently expect to see the time of passage cut down to a little over five days.

All this is very well and betokens a spirit of progressive-

ness among steamship managers that is commendable. Trans-Atlantic voyages are at best wearisome, and after the novelty has worn away, travelers invariably regard the week or more spent upon a steamer as a period of unavoidable annoyance. Any action tending to diminish the time of passage will be hailed with pleasure by ocean voyagers, and all lines will eventually be compelled to build their vessels with special reference to their swiftness. So far so good; no one will complain at the introduction of swift vessels any more than they would at the running of fast express trains, nor is there any greater danger in patronizing a swift than a slow vessel; but the steamer lines do not stop there. They are not content with building and equipping fast vessels, but these same vessels are pushed to the utmost extremity of their speed and subjected to a constant strain for a diminution of their record. Bad weather is no longer taken as an excuse for a slow passage and it is, or seems to be, tacitly understood that the crack boats are to be worked "for all they are worth" on every passage. Nor is this all. It is now clearly apparent that the departure of the vessels is so arranged that two or more of the crack boats sail simultaneously, thus not only bringing their capabilities into rivalry, but confining the rivalry to the identical passage. The trans-Atlantic course is now a huge race-track and the public is weekly edified with the results of a grand ocean heat. Ultimately we presume the book-makers and sporting men generally will seize upon this rivalry as a promising field for betting, and as we are now constantly informed of the sums won and lost on trials of horse-flesh, so will it be with regard to the competition of ocean steamers.

It is to this racing feature of trans-Atlantic steamer navigation that we take exception. We maintain that it is impossible for any vessels to sail at the same hour and traverse several thousand miles of distance, straining every energy to arrive first at the point of destination, and at the same time give a proper regard to safety. We maintain that while a quick passage is always desirable, the passengers are in no wise benefited by the fact that their vessel makes a quicker trip than the vessel of another line, and that in a voyage occupying seven or eight days on the average, the delay of an hour or two, or even of a day or two cannot be of much moment. Persons crossing the ocean do not figure so closely as to reckon upon a few hours, and they cannot be seriously inconvenienced should the trip be slightly longer in time than they expected. Unlike railway travel, ocean navigation cannot be guided by a time-schedule other than a broad and safe computation that the voyage will occupy from seven to ten days; and this fact makes a great difference when a comparison is instituted between the two methods of travel. A traveler on a railway may reasonably expect that a train will run on, or near, its schedule time, and he has a just cause of complaint if without accidents of any sort the train is late in its arrival; but he is guaranteed nothing in a trans-Atlantic voyage with regard to the length of time thereof, and the hour of arrival in port. The one great claim a passenger holds upon the management of the vessel is that every regard shall be paid to safety, and that every other consideration shall give way before this. It is well enough to say that ocean navigation is as safe as railway travel, but the assertion, like many other assertions that have gained credence, is untrue. While the chances of accident to an ocean steamer are possibly no greater than to a railway train the results of accidents are infinitely more disastrous. In the one case the catastrophe is measured by the accident itself—the passengers of a railway train that are not killed or injured by the immediate accident are in no further danger; in the other case the loss of life is contemplated in a dozen ways after the steamer has met with injury. There is the horrible fear of the vessel sinking instantly and carrying its human freight to an ocean tomb; there is the prospect of a perilous voyage in an open boat, scantily provisioned and crowded to its gunwale with terrified human beings whose presence is an additional danger. Death by drowning, starvation, thirst, and even by violence are among the contemplated possibilities of an accident to an ocean steamer. Railway companies have almost universally prohibited the racing of trains upon their lines, and there is scarcely an occasion where it is practised that the public voice has not been vigorous in condemnation; yet in sober truth there is no more danger in the racing of trains than in the racing of ocean steamers, and a catastrophe happening to the latter is almost certain to be followed by a greater loss of life. Why is it that the railways are forbidden to carry on a practice that is commonly indulged in by ocean steamers, and even encouraged by their patrons? Surely there can be no just foundation for this discrimination.

How great, then, is the responsibility resting upon the steamship lines, and how great is the folly, not to say crime, of which they are guilty in every trial of speed which may involve the destruction of hundreds of lives. That this reckless spirit of rivalry will be abated is not likely until some fearful calamity results, and even then the reform will be but temporary, for steamship lines rejoice in one immunity that railway companies do not possess. In a railway accident, no matter from what cause, the company must look for a suit for damages, while the cases are rare when attempts have been made to mulct a steamship line for damages, no matter how criminal the negligence which brought about the accident. Alas! no. The traveling public have but one course to take in order to express their disapproval of ocean racing and to pay due regard to their own safety, and that is by avoiding the crack boats that sail at hours identical with the time of departure of rival vessels, thus appealing to the lines in the most direct and telling channel—through their pock-

ets. If ocean racing is not encouraged by the traveling public, the swift vessels, which are in themselves commendable, will be sensibly handled and conduce to the convenience of their passengers instead of the glorification of their owners and masters.

EDITORIAL NOTES.

A CIRCULAR received from a Wall street firm demonstrates conclusively that the recent panic is over and bears out the assertion made in the June JOURNAL that trade and commerce were not entangled in the meshes of the disturbance. On May 1st, before the panic, the average price of the thirty-two leading and active stocks was $68 per share, and during and immediately after the panic, they fell to an average of $49.52. They have now advanced to $65 per share or but $3 below the highest point in May. Come on with your panics! They don't scare us worth a cent and they serve the useful purpose of uncovering rascality and subjecting the market to a healthful and beneficial purging.

* * *

THE Hudson River Tunnel has superseded the Brooklyn Bridge as the languishing enterprise of the day. Work upon the Tunnel was discontinued some months ago, owing to a scarcity of funds, and it is now stated that the portion already constructed is filling up with water. We are somewhat in doubt as to whether the Tunnel would be of sufficient utility to warrant its completion, for as yet, the railways having termini with connecting ferries on the Jersey shore, have given no sign that the undertaking will receive their coöperation and support. For the use of our Jersey friends alone, without the patronage of through travel, the pecuniary success of the Tunnel would be extremely problematical.

* * *

IT is gratifying to note that the cholera is abating in the infected districts of France and that in all probability this country will be spared a visitation of the dread disease at least during the present year. None the less is it necessary to maintain a strict quarantine and carry out the projected work of cleansing and disinfecting our cities and putting them in a defensive condition. Experience has taught that epidemics generally appear on this continent the year following their appearance in Europe, and if we escape the cholera next year it will be a great triumph of sanitary skill.

* * *

AT last we have had an earthquake and a genuine one too. There was no mistaking the uncanny vibrations of Sunday, August 10th, and while such disturbances are novel we beg to be excused from participating in another, at least for some years to come. Unfortunately old Mother Nature is an exacting old lady and she may not see fit to accept our declination, in which case we will endeavor to put the best face on the matter and be on hand; while in the interim we will continue to publish the JOURNAL and enlighten the railway world.

* * *

THERE is at least one satisfactory feature in connection with the earthquake, which is that the railway and steamboat companies will not be able to advertise "Grand Earthquake Excursions," and that neither BARNUM nor FOREPAUGH nor their imitative rivals will be able to capture or purchase the earthquake and add it to their attractive monstrosities as the "Only Genuine Earthquake on Exhibition."

* * *

ON the whole these are pretty lively times. Within the past three months we have been visited by both a financial and a terrestrial earthquake, and there is the prospect of a political earthquake in November. The cholera scare has been a most active agent to keep our spirits up, and for once the crops have not been ruined by the drought, while to add to the burden of anxiety BEN BUTLER is running for President. Take it altogether, we are forced to conclude that 1884 will not be reckoned a dull year.

How to Deal with Mr. "Grabseat."

IT is a very safe plan on entering a car which has been half turned into a baggage car simply to request the bold solitary occupant of two or four places to remove the parcels from the seat you choose to indicate. It does not suffice to ask "Is this seat taken?" for the Grabseats do not hesitate to imply with a gesture that it is reserved. They mean that they have reserved it, but give you to infer that its occupant has just stepped out. An assured air is the only method of meeting this family on their own ground. You can suggest to the conductor, if he is in the neighborhood, that *he* remove such packages to the rack or the floor; and as you have paid for the seat you occupy, do not be cast down from your composure if, by coughs or a haughty air, your presence is signalled as unwelcome. Reserved seats for baggage or babies are not sold in an ordinary car, though the only way to discover this sometimes is to call on the passenger to show the number of tickets he holds for his barricaded seats. The conductor will do this, at your request, and then—and then only—does this most offensive family give any sign of confusion or humility. At all other times, by a magnificent bearing and a show of great annoyance when questioned, they appear to have chartered the car.—*Philadelphia Ledger.*

THERE is a strong feeling in various portions of the United States in favor of the total abolition of fences. It is stated that the cost of the maintenance of fences annually in this country is not far short of $80,000,000—a pretty snug sum if it might be saved to the farmers. It is estimated that there are 6,000,000 miles of fencing in all the country.

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

IS A SURFACE TRAMWAY ON BROADWAY DESIRABLE?

REGARDING the construction of a surface tramway upon the main thoroughfare of the largest city of the Western continent we have decided opinions, and these opinions are uncompromisingly against the advisability of the contemplated enterprise. Though devoted to the interests of tramway progress the JOURNAL endeavors to view things fairly, and did we own property on the intended route we should oppose the surface road with all the energy of which we are capable; no less should we oppose the scheme now, believing as we do that the road would be an unmitigated nuisance. The casual observer cannot fail to note the frequent jams and blockades which daily occur on Broadway, nor the difficulty with which vehicles are extricated and travel resumed. To drive from Union Square to Wall street requires no little skill on the part of the driver at all times, and the journey is a series of sinuous and tortuous twistings interspersed with some clever legerdemain by which a vehicle is forced through a passage narrower than its own track. Difficult as travel now is upon Broadway, conceive of what it would be were a surface tramway to be operated thereon. The presence of the rails themselves would be a most vexatious hindrance to travel, and the clever twisting and dodging which Broadway drivers are now enabled to practice through long experience would be rendered difficult if not impossible. The appearance of tram-cars would increase this difficulty to a wonderful extent and render Broadway well-nigh impassable. The solid and heavy car would be confined to its rails and in event of a blockade would be denied all lateral movement. No advantage could be taken of clear spots as is now the case with ordinary vehicles, and each succeeding car approaching in either direction would add to the confusion and involve the thoroughfare in an inextricable jam for many streets from the point of blockade. We are not aware of the speed contemplated by the Broadway surface road, but we should think a passenger very lucky if he could accomplish the journey from Fourteenth street to the Battery in a whole morning or afternoon. Just what interest the advocates of "rapid transit" can take in the proposed road we fail to see, for there is certainly no connection of ideas suggested, and the surface road would probably take pre-eminence as the slowest tramway in existence.

If anything could be more absurd than the contemplation of a successful surface tramway on Broadway it is in the discussion of the advisability of making it a cable road or employing an electric motor. While these two methods of tramway traction are in their infancy it is crazily proposed to adopt them on a road whose success under any circumstances is dubious, and whose operation under the primitive system of horse traction is overwhelmingly opposed for conspicuously good reasons. It is needless to say that the foregoing objections to a surface tramway on Broadway would be but intensified were new methods of traction adopted. A cable road would be positively dangerous and an electric motor probably most difficult to operate where instantaneous action is constantly required. On crowded thoroughfares traction itself must have intelligence, not only the person in charge thereof, and it is evident that horse traction will never be entirely superseded for this reason. Granting for an instant that full authority should be obtained to construct and operate a surface tramway on Broadway, it is inconceivable that permission should be given for the employment of any other motive power than horse traction.

But we fail to see why the construction of such a road should be allowed under any circumstances, and despite the assertion to the contrary, made by interested parties and prospective stockholders, we believe that a surface tramway on Broadway is neither a necessity nor a desideratum. On the thoroughfares lying East and West of Broadway at a distance of a block or two there are tramways without number, while the lines of three elevated roads are also but a short distance off. To crown all there are several efficient stage lines running on Broadway itself, providing comfortable stages at short intervals of time, and these stages are capable of greater speed and accommodation than a tramway could possibly offer. They can be guided with skill through narrow passages, can avoid obstacles, and in event of a prolonged blockade, can, by making a detour through a parallel thoroughfare, meet with little or no interruption in their regular trips. In bad weather they can take up and deposit passengers at the curbs and if properly constructed can ride easily without jolting their passengers. The precise advantages which a Broadway surface tramway would have over the Broadway stages we fail to note, but we do perceive a number of objections to the tramway from which the stages are free. In its proper place a tramway is one of the greatest conveniences with which cities may be blessed and far superior to a stage or omnibus; but most emphatically we should say that the most crowded street of the most crowded city in the country is not the proper place for it. Chimerical as the projects of constructing underground or elevated roads on Broadway may appear, the benefits these structures would offer are tangible, and should they be put in operation they would be of great

use and convenience; but a surface road on our proudest street would be an intolerable nuisance, conferring no benefits which the citizens do not enjoy at present, and an outrage upon the public at large and the owners of property along the route.

CABLE RAILROADS.

(Continued.)

BY W. W. HANSCOM, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

AT the point where the cable is taken into the engine-house, it is passed down over a vertical sheave eight feet in diameter into a pit, and thence, at a right angle, under another sheave of the same diameter to a driving-drum at the rear of the engine-room or side furthest from the street. It passes a half-turn around this drum and is carried toward the street a short distance, and passing a half-turn around a sheave eight feet in diameter, it is carried back again to the driving-drum, and taking another half-turn, it is again led to the street, going around two sheaves to reach the tube in the same manner in which it was led from it into the engine-house.

Fig. 1 is a plan view in outline showing the sheaves for leading the cable from the tube to the engine-room which is below the level of the street. A A are the sheaves for deflecting the cable. B is the driving-drum and C the loose or idler sheave. It will be seen that the sheave C is inclined. This is for the purpose of conducting the cable as it comes off from one groove of the driving-drum to the other groove which is eight or ten inches away.

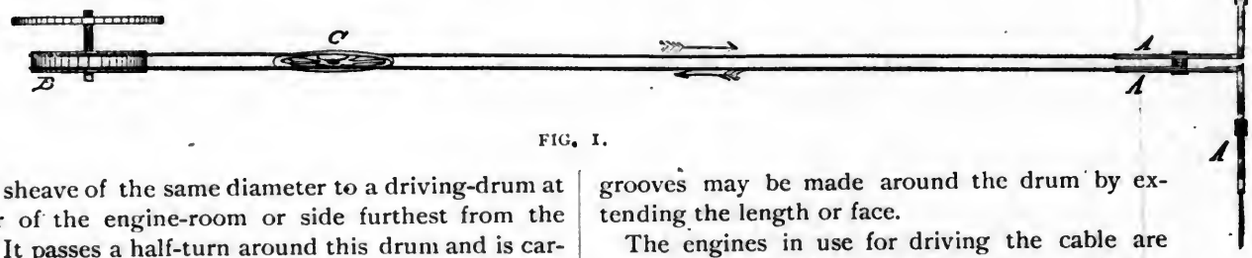


FIG. 1.

There is a distance of fifty or sixty feet between the sheaves A A and the drum B, and slides or ways are so placed that the sheave C may be moved close up to the drum B, or nearly to the sheaves A A, and securely fastened at any point. This is done so that any stretch in the cable which occurs may be taken up; and as the stretch usually amounts to one per cent. of the length of the cable, the distance required in this case would be one-half of 110 feet, or between fifty and sixty feet. When the cable is first put in the sheave C, the sheave will be close to the driving drum, but as the cable stretches it will be moved further away, until it reaches its limit or the cable is worn out. Fig. 2 is an elevation outline showing the direction of the running of the cable.

The driving-drum has clips around its circumference forming a groove into which the cable runs, similar to the well-known English Fowler's clip drum. Figs. 3 and 4 show the general construction. Around the periphery are cast grooves having stops at intervals, and into these grooves are placed the clips A A, the spaces between them being about equal to their width. These clips are so constructed that the cable in passing around the drum lies in the groove formed by them, and as the strain comes it tends to press them toward the center of the drum thus bringing the sides closer together and compressing the cable. This compression is sufficient to prevent the cable from slipping with any strain that is required in hauling the cars over the steepest grade in San Francisco. In this case the cable passes half way round the drum twice, equal to one full turn. These clips are so arranged as to be easily removed and replaced when worn. Any number of grooves may be made around the drum by extending the length or face.

The engines in use for driving the cable are known as the "Rider cut-off" and have cylinders fourteen inches in diameter by twenty-eight inches stroke. They make 120 revolutions per minute. There are two cylinders connected with a single shaft having a crank at each end. As one cylinder is sufficient to do the work, the other cylinder is disconnected and kept in reserve, the engines being usually run from six to ten months, alternately, unless circumstances require a change from one to the other at shorter intervals. Two boilers are used of the round tubular pattern, the shells being fifty inches diameter by sixteen feet long, and having fifty three-inch tubes. They are set up in brick-work so arranged that either or both can be used at one time. One boiler is sufficient and the other is kept in reserve, changes being made from one to the other every month unless sooner required by bad water or other conditions. As soon as a change is made from one to the other, the one which is relieved is immediately cleaned, and any needed repairs made and the boiler filled and placed ready for firing up at short notice.

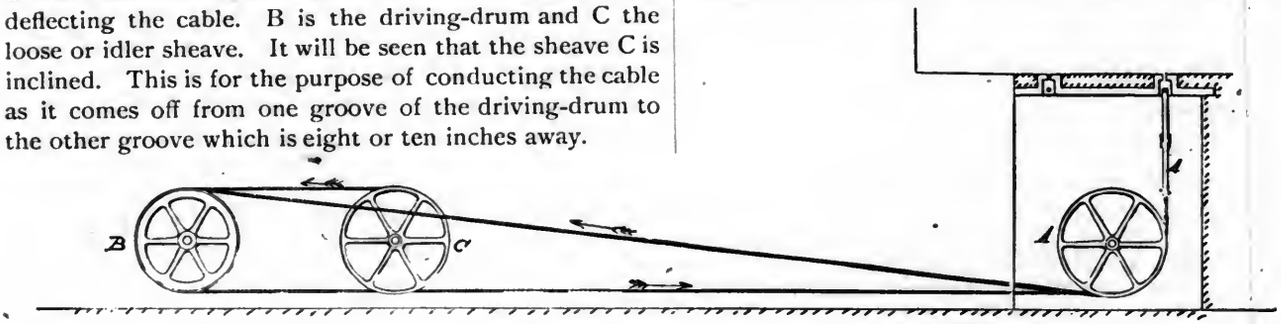


FIG. 2.

As the cable runs six miles per hour, or 528 feet per minute, the drum which drives the cable, being eight feet in diameter, makes about twenty-one revolutions per minute, and as the engine makes one hundred and twenty revolutions, an intermediate shaft and spur gearing is used for reducing the speed from engine to drum.

When a cable is put in the tube for the first time, the

large reel on which the cable is wound when it comes from the factory, is placed at any convenient location near the tube, and a shaft is put through the center of the reel to serve as an axle. The reel is then set up in a frame so that it may revolve freely. The end of the cable is now taken from the reel and passed down through the slot or hatch into the tube, and has connected to it a thin bar of iron with an eye at each end. This bar of iron has one end passed up through the slot, and to this are hitched as many horses as may be necessary, and the bar with the

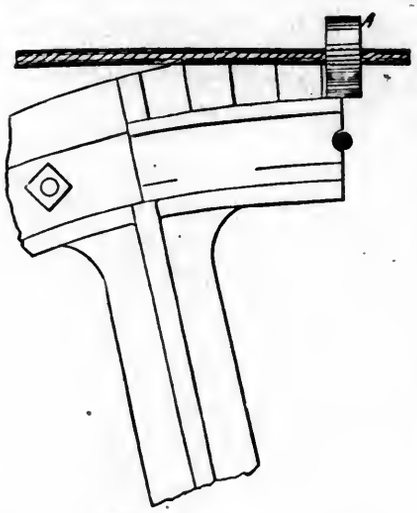


FIG. 3.



FIG. 4.

end of the cable attached is drawn to the terminus of the road, when the end of the cable is passed around the horizontal sheave. The horses being again attached, the cable is hauled to the other end of the road and is passed around the large sheave at that end to the place of starting. A sufficient quantity of the cable is then allowed for a splice and the balance cut off. Usually several hundred feet more are purchased than is actually necessary for the exact length, as the quantity left over is usually absorbed in repairs to the cable during its life. In taking the cable through the tube it is passed into the engine-house and around the drums during its journey, unless the starting point is at the engine-house and the ending at that point, in which case the drums in the engine-room are the last to be covered by the cable.

After the cable has been drawn around the road and cut, a stopper is put on near one end and all the slack is drawn in from the other, leaving a sufficient distance from each end to make a splice; after which the stoppers are taken off and the cable dropped into the tube through the slot which has been made wide enough by taking up the covering straps which adjust or regulate its width for a distance of say two hundred feet. When this cable becomes worn so that it has to be replaced by a new one, the old one is cut and the ends of the new are spliced to it, and it is drawn through by the engine, the old cable being wound upon an additional reel supplied for the purpose, cranks being attached to the axle and turned by hand as the new cable is slowly drawn in.

In addition to the sheave in the engine-house for taking up the stretch of the cable, this road has at each terminus means for the same end by placing the horizontal sheave upon a carriage having wheels to roll upon a track in line with the lines of track. This carriage is drawn backward by means of a weight attached to it by a chain passing over a fixed sheave, the weight having a vertical movement equal to the desired movement of the carriage which is about ten feet. These movements are automatic, and keep an equal tension on the cable at all times.

(*To be continued.*)

An Electric Tramway in Cleveland.

THE electric tramway in Cleveland, O., whose completion has been awaited with much interest, is now in operation, and its success is positive and gratifying. The road has been constructed under the supervision of the inventor, Mr. Walter H. Knight. A speed of fifteen miles per hour can be maintained, the current being generated by a Brush dynamo and supplied through electrical conductors placed in a channel between the tracks. The motor employed will be adopted by the East Cleveland Street Railway Company, and the ultimate success of electric tramways seems settled without dispute. The Cleveland *Herald* gives the following account of the opening of the road: "The experiment of running the car was a success, speaking in general terms, although the new and untried condition of things made several stops necessary, and the arm holding to its place the central brush that receives the electric current from the trough in the middle of the rails was too weak, and finally broke as the car was returning to the barn after having run up and down the track several times. Four miles from the barns from which the car started, a thirty horse-power dynamo-electric machine like that in the electric-light works was running. Over a No. 6 wire the electric current flowed to a pole opposite the barns, and it slid over wires heading down from this pole into a submerged trough between the rails. This trough extends the whole length of the Garden street extension, a mile long, and an aperture about an inch wide runs the length of the trough. Fastened to this trough by insulators on each side of the aperture are two iron bars, looking like miniature T railway rails. Over these flow the two currents of electricity. A broad iron reaching down through the aperture and projections on this iron, called brushes, fit into the space between these rails. These brushes catch up the electric fluid and transmit it up to the motor beneath the car. This motor is almost a miniature reproduction of the dynamo machine at the electric-light station. Every two horse-power of the dynamo machine at the station gives one horse-power on the road. Thus a power equal to fifteen horses was coursing through the submerged trough, and the inventors claimed that at least eight loaded cars could have been run over the line. The trouble has been with nearly all electric street railways heretofore that it has been possible to run not more than two cars at a time. The electric current having been brought up from the submerged rails, is transmitted to the motor by brushes on the bearings that give out bright green sparks of electricity, while the brushes running in the groove between the rails seem to shoot forth at times a reddish fire. The young man with the lever in hand pushed down the bearing brushes on which the electric current was waiting to jump to the motor. The connection with the car motor having been made, the armature began to revolve rapidly and turn the pulleys, over which ran a belting made of four-coil wires, which ran over a larger wheel and thence to the wheel inside the car-wheel proper and attached to the same axle.

Then the car moved off. It swept around the sharp curve with ease. It could, the inventors claim, be made to run at eight or even fifteen miles an hour—the ordinary street car does not exceed five. Lest small boys should stuff obstacles in the crevice between tracks, a steel sweep will be rigged in front of the brush that runs in the crevice. Ice and snow, being non-conductors, will not be a source of much trouble; but, while frozen water is a non-conductor, water in its normal state is a good conductor of electricity, and to carry it out of the trough, little catch-basins will be built at frequent intervals. 'The cost of fitting up this mile of track did not exceed $5,000,' said one of the syndicate of Cleveland and New York capitalists interested in the electric street railway venture. 'It would cost about $60,000 a mile to alter an ordinary street railway to a cable line.'"

A Cable Tramway in London.

A CABLE tramway is now in successful operation in London, on Highgate hill. The grade was too steep for horses, and its managers successively abandoned the projects of employing locomotives, compressed air and electric motors, determining to adopt a cable system. The steel wire rope used on the road—which is made endless by very careful splicing, extending over 40 feet, in order to secure a joint which shall not be larger than the uniform dimensions of the cable—is seven-eighths of an inch in diameter and composed of six crucible steel wire strands wound over a hemp core. The line is sinuous and irregular, and consequently it has exercised all the skill of the practical engineers to overcome the difficulties encountered in the best and most efficacious ways. It is about a mile in length, and the many curves vary in their radii from 3,000 to 500 feet, except at the points or switches, where the radius is 75 feet, and at the engine-house, where it is 60 feet. The gradients of the road vary from one in ten to one in seventy-five. The character of the road has necessitated frequent deflections of the cable, both vertical and horizontal. In many instances the permanent way does not occupy the center of the public road, but runs nearer to the east or the west curbs, the reasons for these deviations being the need to get the greatest lengths of radius for the various curves which the nature of the ground demanded. In its construction the cable road closely resembles the well-known cable road in Chicago, from which it has been copied.

The Broadway Surface Tramway.

THE Board of Aldermen of New York City, at a recent meeting, granted a franchise to the Broadway Surface Railroad Company by an almost unanimous vote, one Alderman only opposing the measure. The franchise is granted for no consideration whatever, and this action on the part of the Aldermen has provoked wide-spread indignation, it being claimed that $1,000,000 with five per cent. of the profits could easily have been obtained had the franchise been sold at public auction. Mayor Edson has been urged to veto the measure, but as yet he has not announced his intentions with regard to it. Should he approve it, the matter will doubtless be opposed in the courts. Many property owners along the proposed route are open and avowed enemies of the scheme.

Matched Car Horses.

A REPORTER of a New York paper boarded the front platform of a west side street-car, the motive power of which was a team of buckskin-colored horses with white manes and tails precisely alike. Coming down on the opposite track was a pair of dappled grays equally well matched. The driver stated in response to an inquiry that the company made it a point to match the horses in color as far as possible.

"They owns about ten hundred horses," the driver continued, looking at the reporter unconcernedly, "and employs a man specially to match 'em. He's an issthitic. You musn't smoke on the platform."

"Do horses pull better when they are matched in color?"

"No, they don't pull any better, but it makes a difference with some of the patruns of the road. I cum down one mornin' with a pair of old plugs that was makin' a series of farewell trips, and a Twenty-seventh street dude who allers waits for my car went over and tuk a Broadway stage, an' I hain't saw him sence."

TRAMWAY NOTES.

THE electric railway at Brighton, in England, is a success. It runs along the shore every ten minutes, picking up passengers as it goes, and can be stopped, when hailed, as easily as an omnibus. Its motion is sliding and pleasant while its capacity is apparently unlimited. It is to be extended to the western end of the Brighton beach, and is then expected to yield a very handsome revenue to its promoters.

MR. W. W. HANSCOM, whose series of contributions on "Cable Railroads" is now being published in the JOURNAL, was the engineer in charge of the construction of the cable tramway recently put into operation in London. It is a singular fact that none of the English papers have credited an American engineer with the performance of the engineering work.

ONE line of tramway in Brussels is to be equipped with electric motors which are to be used for one year, an accurate account of expenses being kept to determine the relative economy as compared with horses. Should the experiment be successful, all the lines in Brussels will be similarly equipped.

THE preliminary injunction recently granted restraining the Forty-second Street, Manhattanville and St. Nicholas Avenue Railroad Company of this city from laying their tracks through Forty-second street, has been dissolved by Judge Ingraham in the Superior Court.

THE Essex Passenger Railway Company of Newark, N. J., are constructing a tramway through the lower part of the city. It is to connect with the disused East Newark tramway, which is again to be operated, crossing the Passaic river at the Bridge street bridge.

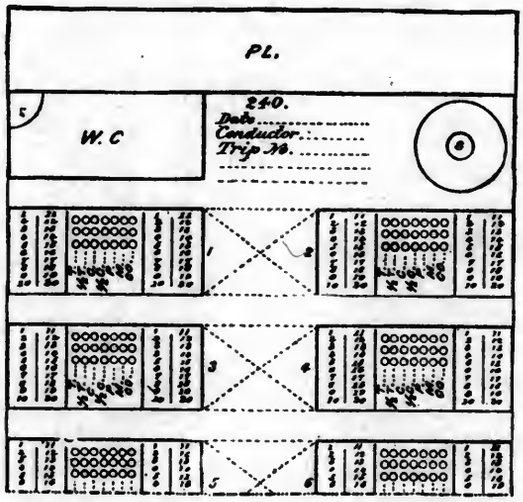
THE managers of the North London (Eng.) tramways have ordered fifteen small steam locomotives for use on their roads.

AN improved horseshoe is illustrated and described in the department of New Inventions of this number.

New Inventions.

Eldred's Check-list for Registering Railway Passengers.

SAMUEL D. ELDRED, of Minonk, Ill., has devised and patented a check-list for registering railway passengers, a section of which is herewith illustrated. This check-list is designed to protect the conductor from imposition by designing persons who ride short distances without tickets or without paying their fare, and from others who provide themselves with tickets, return or single, but ride further than the tickets read. It is also for the protection of railway companies from dishonest, careless and inefficient conductors and other officials, especially those who grant passes, and from scalpers and ticket-selling schemes and conspiracies, as it furnishes the auditor with the exact condition of each trip's traffic. Its use will also furnish data for many other useful and interesting features, since by it can be told the exact proportion that each section, division, and even station of the road pays toward passenger traffic.



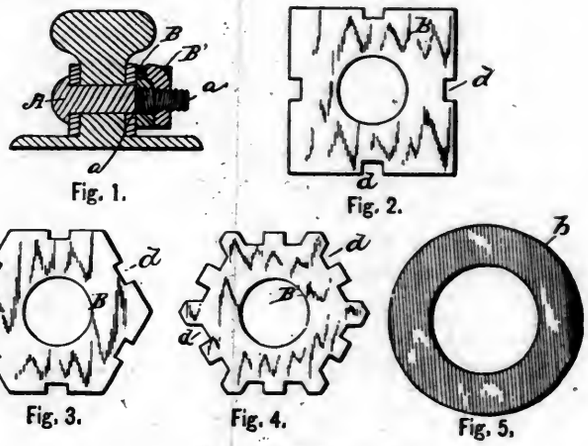
ELDRED'S CHECK-LIST FOR REGISTERING RAILWAY PASSENGERS.

The check-list furnishes the company an exact statement of each trip in concentrated form for preservation and reference. The list may be in the shape of a coach, as shown in accompanying cut, and is furnished with the station numbers on each seat, in two columns, one under heading "From," the other "To," and the conductor punches these as he finds them occupied. Each seat has also letters or characters designating the kind of fare taken as cash, half-cash, local, or half-ticket, coupon, mileage, or pass, etc. Duplicate "trip checks" may also be issued with stations thereon, folded so that both checks may be punched at once, and the company may require these to be accounted for in books of 100 statements, or thereabouts, which shall tally with the check-list each trip. Finally if they wish to put a "spotter" on the train occasionally, any one that can count will discover any irregularity; while in the present system the highest-priced experts often fail to find the leak.

It is the intention of the patentee to devote all the proceeds realized from his patent to the establishment of a home and labor school for friendless children.

Williams' Patent Nut-lock.

CHARLES A. WILLIAMS, of Lawsonham, Pa., is the inventor and patentee of a nut-lock, the peculiarity of which is the employment of a double-threaded bolt. In the accompanying illustrations, Fig. 1 is a sectional view of the nut-lock as applied to a rail-joint, and Figs. 2, 3, 4 and 5 show the parts in detail.



WILLIAMS' PATENT NUT-LOCK.

In Fig. 1, A is a bolt having a right-hand screw-thread *a*, and a left-hand screw-thread *a'* with an offset between them, one threaded portion being of greater diameter than the other. Use is next made of two nuts B B'—one, B (Figs. 2 and 3), which is intended to secure the bolt, screwing upon the right-hand threaded portion *a*, of the bolt A, against a washer *b* (Fig. 5), and the other B' (Fig. 4), which is designed for locking the bolt-securing nut, screwing upon the left-hand threaded portion *a'*, thus preventing the nut B from being jarred loose by the vibrations of a passing train or from any other source. To accomplish this result effectually it is also necessary to prevent the jarring and loosening of the locking-nut B', which is done by providing both nuts with peripheral notches *d* (Figs. 2, 3 and 4), the nuts being either four-sided or polygonal in form, and by bending any one or more of the tongues of the locking-nut B', into the corresponding notches of the bolt-securing nut B, the two nuts being thus firmly locked together, and incapable of being loosened by jarring from any source. The locking nut B' need be only thick enough to contain two or three threads, and the tongues need not be bent into the notches of the bolt-securing nut B, to a depth of more than one-sixteenth of an inch. The device may be locked and unlocked as often as desired.

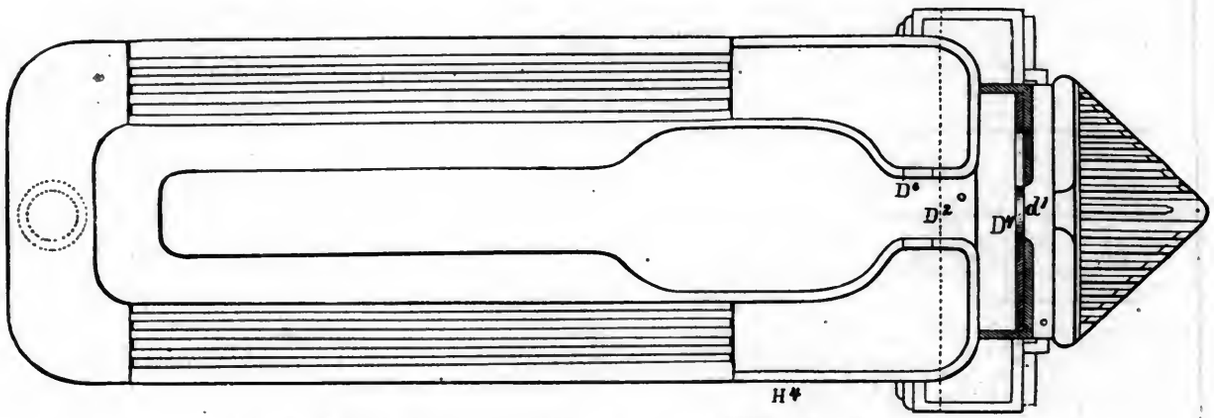
The nut-lock can be applied to railway rail-joints, to holding piston-heads in engines, and cup-heads in pumps, and in a number of cases where an immovable nut is required.

Mealey's Car-coupler.

JOHN MEALEY, of Prescott, Ontario, Canada, has contributed another automatic car-coupler to the increasing number of railway inventions, and in many respects it presents novel features. In this device the coupling-pin extends horizontally through the draw-head, the latter being provided with two vertical slots. In one of these slots is attached a curved hook, while the other receives

the corresponding hook on the approaching draw-head. When the draw-heads come together the two hooks are forced up and over the coupling-pins, and falling into place, the cars are coupled automatically. The cars are uncoupled by means of a chain and lever attachment extending to the top of the car and also to the sides, thus obviating the necessity of brakemen going between the cars. The draw-heads are also arranged for the ordinary link-and-pin coupling, a cylindrical slot being made through the draw-head between the before-mentioned vertical slots, which receives the coupling-pin in the usual manner, while on the face of the draw-head is provided a horizontal slot to receive the link.

The inventor has also added an improvement to the device in providing a sliding step on the top of the car, projecting forward to close the opening between the cars, this step being provided with a spring which keeps it in the desired position, while giving it the necessary play.



ROTHROCK'S IMPROVED LOCOMOTIVE AND STEAMBOAT BOILERS. FIG. 1.

Rothrock's Improved Locomotive and Steamboat Boilers.

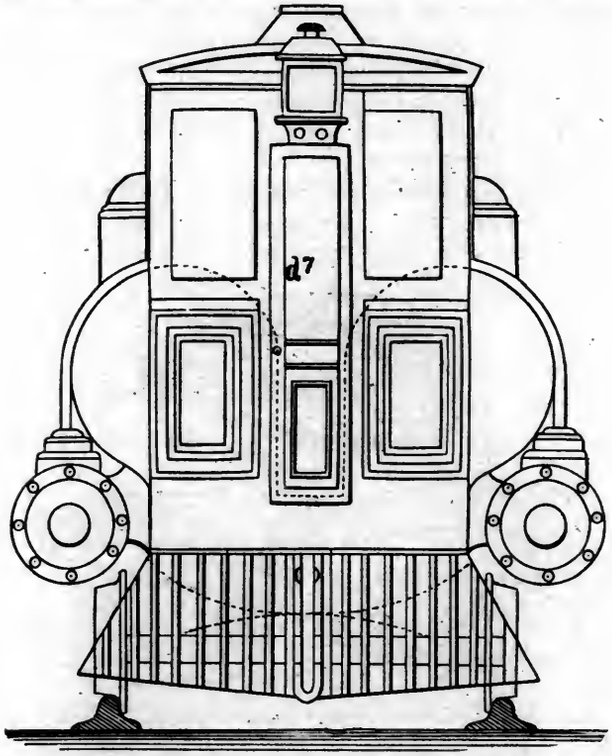
OSCAR ROTHROCK, of Beech Creek, Pa., whose patent safety devices for locomotive-pilots were described in the last number of the JOURNAL, is also the inventor and patentee of certain improvements in locomotive and steamboat boilers which are herewith described and accompanied with explanatory illustrations. The invention relates essentially to locomotive boilers; but it is applicable to portable or stationary engines generally, and peculiarly to small steam-yachts where economy of space is desirable, and where the cabins and state-rooms are to be kept neat and clean and as far as possible from contact with the fuel. A further advantage is derived in overcoming the difficulty of ballasting small steam navigating vessels. In the old way the weight is periodically changed, as in the case where the fuel is all consumed and loaded up again which causes a displacement in one end of the vessel, the boiler and operating machinery being in the other, thus causing an uneveness of the set of the boat in the water. In the construction of boiler here described all the machinery may be centrally located in the vessel, the central depression between the twin boilers forming the fuel space, so that as the fuel is gradually used up the boat becomes lighter, without its evenness or set in the water being disturbed. Thus is combined with the construction of boiler the manifold advantages of having all the machinery, the boiler and its fuel in one compact section, and occupying but little space. A further object of the invention is economy in fuel which is obtained by enlarging the heating surface and fire chamber of the boiler.

Figure 1 represents a horizontal longitudinal section of the boiler with a depression and passage on its top shown in plan, leading to the engine-room, and also a plan view of the fire-box. Fig. 2 is a front elevation showing the cab or housing extending down upon a platform located in front of the fire-box and provided with an entrance door. Fig. 3 is a vertical cross-section of the boiler as applied to a vessel or boat, the arrangement of which will be readily understood. The reference lettering is the same through the illustrated diagrams.

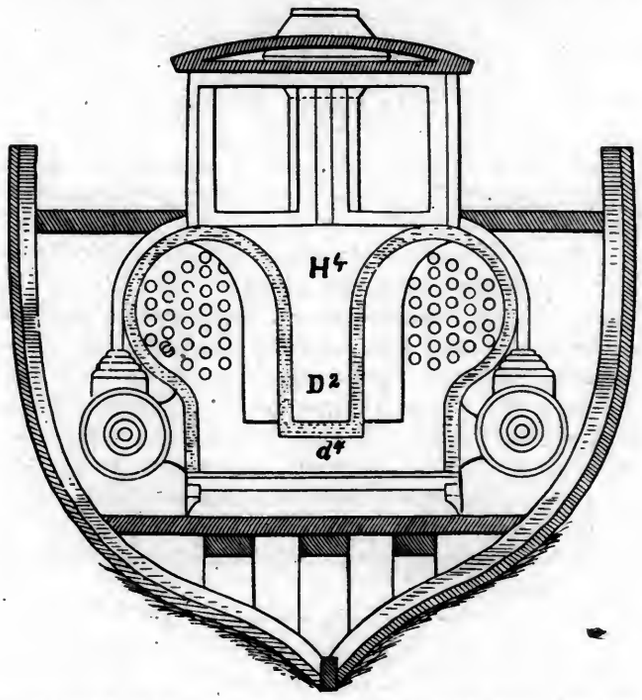
Instead, as heretofore, of securing the cylinders to the engine-frame or to the smoke-box, they are in this case secured to the water legs of the boiler by means of which much radiation of heat heretofore lost is prevented by the close proximity of the steam-cylinder to the fire-box where the air is constantly of increased temperature. The platform D_4, is located immediately in front of the boiler fire-box and leads into the engine-room, or into the reservoir or passage between the boilers. The pendent double water partition may extend to the grate, but preferably in the form shown. The cab extends in front of the fire-box and encloses the platform D_4, which increases the size of the engine-room, and is provided with front and side doors d_7, so as to enable the engine attendants to have ready access between the boilers, and to the working machinery generally. The top, front and the lining of the passage in the fire-box is formed by a water jacket H^4, which may communicate either with the water or steam space of the boiler, but preferably with the water space whereby advantage is taken of the well-known effects of water circulation. The boilers run parallel to each other and are provided with tubes which either lead to a smoke-box common to both, or they may be provided with separate smoke-stacks. The upper portion of the fire-box being divided into two chambers, each chamber must have separate fuel doors D^6, and which may be fired or stoked alternately.

The advantages of the enlarged fire-space and heating surface as compared with narrow and contracted fire-boxes are well known; but it may be said generally, that when a bed of fuel is very deep and the air to support combustion is supplied from below the grate, the air is nearly all consumed before it reaches the fuel on the surface of the

fire; thence the layers of fuel lying in the upper portion of the fire-box are without air, and thus the gases generated from them pass into the open atmosphere unconsumed. But with the enlarged fire-space shown in the drawing and with the fuel evenly spread over the grate surface to the required depth, the air has full access to all the fuel alike, and thus an even fire is maintained, all the gases are consumed and the annoyance of smoke is obviated. Therefore it will be seen that with a perfect combustion is had an economy of fuel, and a more intense heat. The heat being uniform, expansion and contraction of the boiler seams are prevented.



ROTHROCK'S IMPROVED LOCOMOTIVE AND STEAMBOAT BOILERS.
FIG. 2.



ROTHROCK'S IMPROVED LOCOMOTIVE AND STEAMBOAT BOILERS.
FIG. 3.

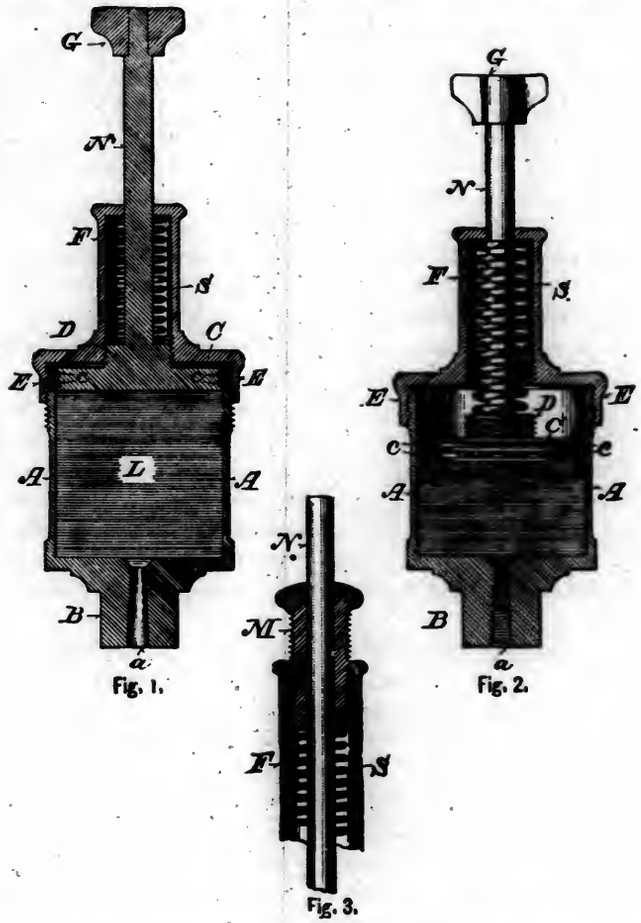
The circulation of water between the boilers through the chambered pendent partition is so great that all parts of the boiler is of even temperature. The currents of water are so rapid and cleansing that sediment has no time to settle and thus incrustation is prevented. Should it be necessary to blow off the boiler, the water in the jacket surrounding the boilers will be found sufficient to supply the boilers until steam is again raised to work the pump or injection until a new supply is obtained.

The pendent partition is flaring from its front to the rear of the fire-box, the flaring or diverging sides retarding to a considerable extent the gases arising from the green fuel fed at the front of the furnace; and by this retardation, time is given them for ignition, thus affording means for preventing the escape of unconsumed gases.

The inventor has procured patents for his invention in the United States, Canada and Germany.

Felthousen's Automatic Lubricating Cup.

BARRENT W. FELTHOUSEN, of Milwaukee, Wis., is the inventor and patentee of an automatic lubricating cup which is herewith illustrated and described. It consists



FELTHOUSEN'S AUTOMATIC LUBRICATING CUP.

of a cup or receptacle provided with a self-packing piston fitted to slide up and down in the cup, together with a spring to force the piston down upon the contents of the cup and feed the same until it has all been expelled from the cup. Its object is a cup for grease, heavy oils, and lubricating compounds, which may be automatically fed

by the continuous expansive force of a spring compressed when the cup is filled. Figure 1 is a medial vertical section of the device, showing the method of filling the cup and compressing the spring. Fig. 2 shows the cup in operation; and Fig. 3 a slight modification for regulating the tension of the spring. The reference-lettering is similar in the three figures.

A is the cup proper, cylindrical in general form, provided with the neck B, by means of which it is secured to the box or bearing to be lubricated, and externally threaded about its upper end to receive and engage with the internally-threaded cover E. C is a piston adapted to slide up and down within the cup A, and provided with the stem N, about which is placed the spiral spring S, while *c c* are annular channels or grooves formed in the outer bearing-face of the piston C, which form an air-packing and prevents the oil or lubricant from leaking past the piston. A small vertical cylindrical chamber, F, is formed upon the cover E, for the reception of the spring S, which bears above against the top of the chamber and below against the top of the piston C, or against the shoulder D, raised upon the piston about its stem N. The shoulder D is threaded to engage with a screw-thread cut in the lower end of the chamber F, whereby the piston is held close up to the cover E while the cup is being filled and the cover replaced. The stem N passes up through the top of the chamber F, which furnishes a bearing therefor, and is provided at the top with the head G, by means of which the piston is retracted, the spring S compressed and the threaded shoulder D caused to engage with the thread in the chamber F, for the purpose of filling the cup. A passage *a*, leads from the bottom of the cup or receptacle A, through the neck B, to the bearing or box to be lubricated. To offer as little resistance as possible to the free discharge of the lubricant in the cup, the passage *a* is made tunnel-shaped at the top and gradually diverging below.

For the purpose of regulating the spring S, a long adjusting-nut M, is employed, bored out through the center to receive and form a bearing for the stem N of the piston, and externally threaded to engage with a thread cut in the opening through the top of the chamber F. The nut M has a milled head projecting above the chamber F, and a square-faced end resting against the top of spring S. By this means any desired tension may be secured and maintained in the spring S by turning the nut M in or out.

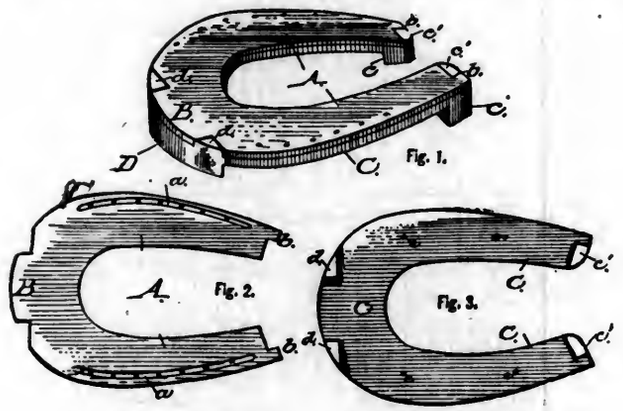
To operate the device the cup is first attached by means of its neck B to the bearing or box to be lubricated, the cover E is then removed, the spring S compressed, and the threaded shoulder D screwed up into the chamber F, whereby the piston C is held up closely against the cover. The cup is then filled with the lubricant L, and the cover screwed down in place. The shoulder D is then unscrewed from the chamber F, and the piston C, thereby released, is forced by the spring S, down upon the contents of the cup, which will be gradually forced out through the passage *a* as it is needed until the cup is emptied. Thus a lubricating cup is furnished which by means of a constant automatic spring pressure, will feed the lubricating compound when the cup is nearly empty as well as when it is full.

The inventor has assigned the patent rights to Messrs. Wadhams, Magie & Co., dealers in oils and lubricants, of Milwaukee, Wis.

An Improved Horseshoe.

MAJOR G. C. GOODLOE, of the U. S. Marine Corps at Washington, is the inventor of a device that may be of interest to those tramway managers whose roads employ horse traction. The invention, of which we give an illustration in detail, is an improvement in horseshoes, in which is employed a stationary plate in conjunction with a bottom or removable plate.

Figure 1 is a perspective view of the shoe, and Figs. 2 and 3, views in detail. A represents the part of the shoe which is to be permanently attached to the horse's foot.



GOODLOE'S IMPROVED HORSESHOE.

It is made in the usual form, with grooves *a a* on the under side, in which the heads of the nails are placed. At the toe of the shoe A, the parts on each side thereof are cut away to form the projection B, and the heels are also cut away to leave projections *b b*, as shown in Fig. 2. C represents the movable part of the shoe, formed similar to the upper stationary part, but with a toe-piece D, having the upwardly extending portions *d d*, fitting and extending upward on each side of the projection B, and between which the projection B on the stationary part is adapted to be placed. The heel of the movable part C, is provided with the pieces *c c*, preferably made integral with the plate or piece C, and project down at right angles with the plane of the lower piece C, and having the upwardly extending projections *c c*, adapted to fit against the heel of the stationary part in the space formed by the projections *b b*. The movable part is secured to the stationary part of the shoe by screws, which enter screw holes *e*, and pass into the upper piece A. When the removable part becomes worn, a new one can be easily substituted. The projections prevent any lateral or longitudinal movements caused by heavy or unusual strains upon a horse. For hard roads, or concrete, a thin piece of gum or paper will prevent concussion and cracked hoofs. Gum, leather, or sheet iron can be used between the shoes thus keeping the feet of a horse perfectly clean in any weather.

A BRIDGEPORT dispatch describes an invention which is alleged to have been made by a man in that place, whose name is said to be Rosenfelt. According to the statement it is a pilot for locomotive engines which, instead of killing people it meets on the track, lifts them gently off. It is described as fitted with spring cushions and as having been tested first on chickens and dogs, and then on human beings.

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Counsellor in Patent Causes and Solicitor of Patents.

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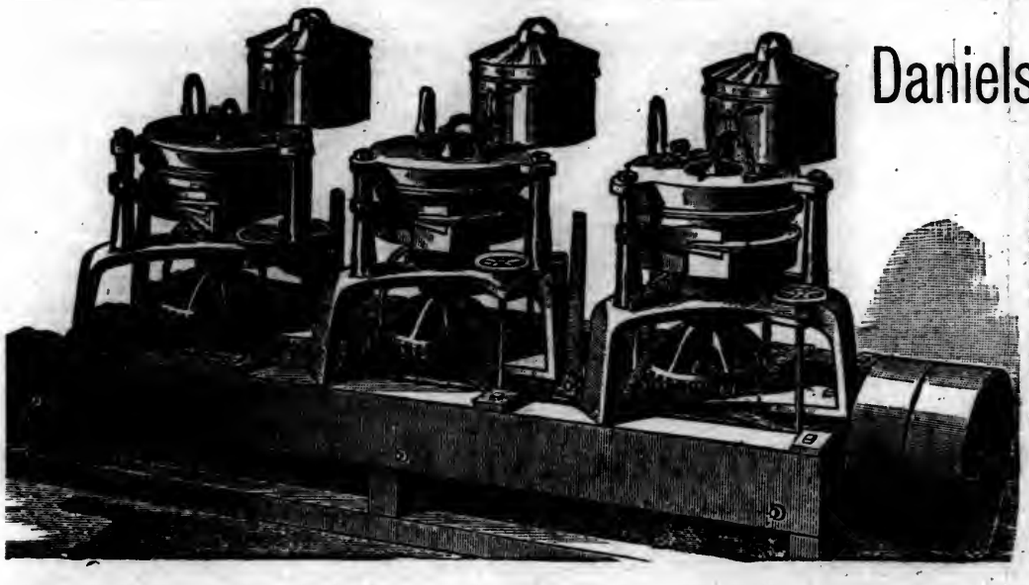
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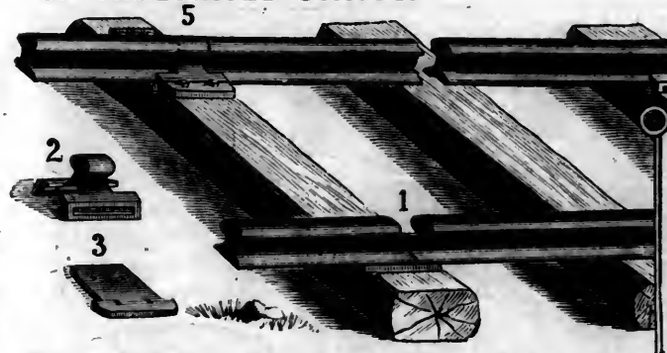
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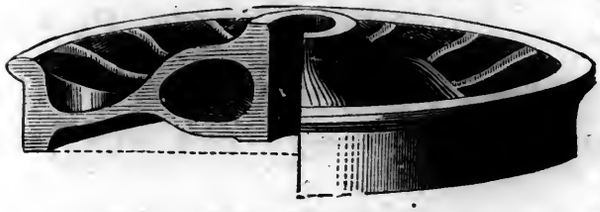
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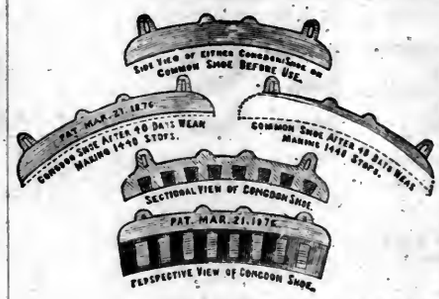
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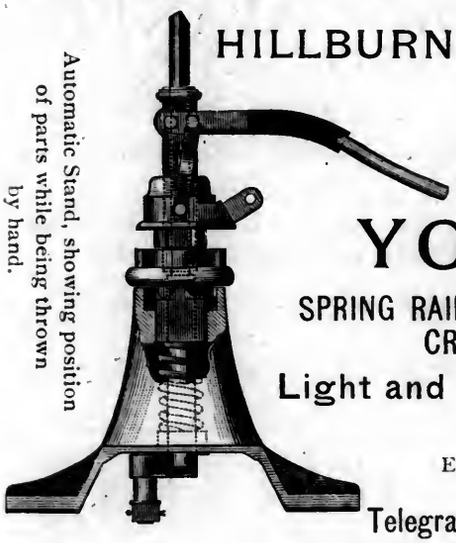
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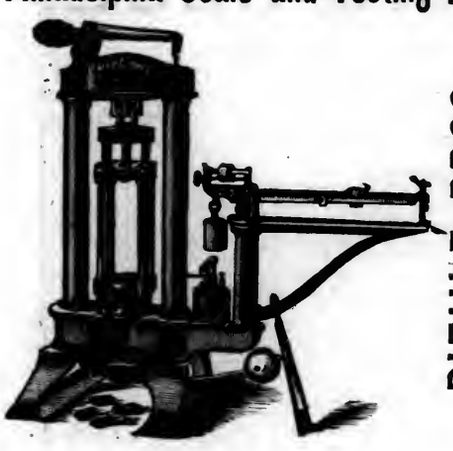
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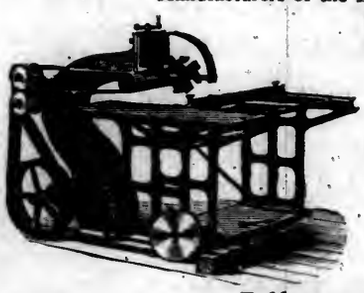
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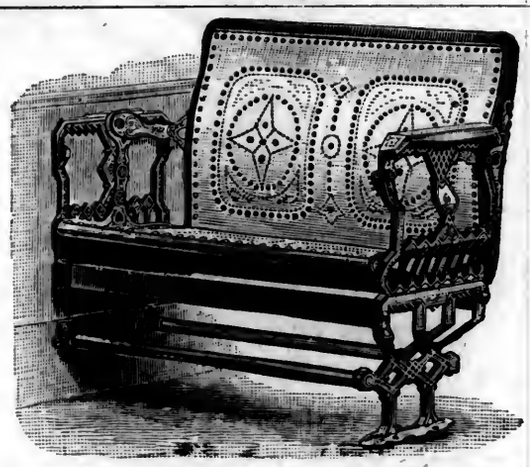


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American Railroad Journal.

WHOLE NO. 2,556.] NEW YORK, SEPTEMBER, 1884. [VOLUME LVIII.—No. 6.

RAILWAY ART.

BY CHEMIN DE FER.

[Written for the AMERICAN RAILROAD JOURNAL.]

THERE is scarcely a single department of railway management in which the true artist may not "spread himself." From the architecture and decoration of railway stations to the simple typographical perfection of railway time-tables and tickets there is room for the skillful exercise of æstheticism which I maintain is but another name for art in its broadest sense. The truth of this assertion is evident when the development of railway art during the past ten or fifteen years is considered, and a contrast is drawn between railway decoration of the present and railway unsightliness of the past. Nearly everyone can remember when railway stations even in great cities presented a mixed appearance of jails and fish-markets, and when the passenger-cars resembled animated cheese-boxes the interior of which were hideous with oil paint smeared on ceilings and sides. A handsome railway station was a thing unknown, and the beauty of passenger-cars was in inverse ratio to the amount of paint bestowed by a lavish but undiscriminating hand.

The era of tasteful railway stations has but just dawned and full daylight has scarcely yet been let in upon the subject. Without doubt there has been wonderful improvement in this direction, and railway station architecture has become a study for architects and a branch of business by itself; but there are still too many of the old structures in existence and they are being patched up to stand further wear instead of being ruthlessly torn down to make way for the progressive march of railway art. Railway station gardening has likewise come to the fore, and the wearied, dust-begrimed eye of the traveler is now gladdened at frequent intervals by the sight of stations peeping out from variegated flower beds and parterres of rich-hued leaves. Yet there are numerous stations which stand upon barren gravel and ash-heaps, casting an unwholesome gloom around the neighborhood.

Well do I remember the advent of the parlor-car and the gorgeous contrast which these vehicles offered to the dingy and grimy box which answered the purposes of ordinary travel. These wonderful new cars were then called "palace cars" and in truth their appearance did seem palatial contrasted with that of the ordinary car, and yet so marked has been the growth of art in the construction and decoration of passenger-cars that the early parlor-cars would fall immeasurably behind the new passenger-car of to-day. They, too, were but creations of paint and gilding and sadly lacked art. Car-painters have changed their tactics and fortunately for the traveling public the virtues of paint are no longer measured by the amount of it. Passenger-cars are now almost devoid of paint in their interior decorations, natural woods being substituted, while what little color is used is confined to light and graceful fresco-work and the heavy daubs of oil are no longer visible. The employment of natural woods as a finish for the interior of railway passenger-cars is commendable in more ways than one. Not only does it permit of more thorough cleaning but it never grows shabby, and every day a richer tone is imparted to the wood which if properly seasoned will outlast the framework of the car itself. The upholstery and interior fixtures of passenger-cars are also greatly improved, and down to such details as brackets and door-knobs the artist has worked wonderful changes; the old unsightly oil lamp emitting a feeble gleam and doleful odors has also disappeared and in its place has come the gas or electric burner, casting a bright light through the car. As to the exterior of passenger cars the beneficial changes have been little less marked. Dark and rich colors with simple lettering and numbering have taken the place of the gaudy coloring and scroll-work of a few years ago, and the useless and inartistic panel which in former days was always let into the sides of cars has almost disappeared.

To my eye there is nothing more perfect in artistic construction than the American locomotive as it comes from the shop. No hand can improve the art of science and one can well understand the pride of locomotive engineers in keeping their engines bright and glistening and their assiduity in oiling and polishing every inch of metal a dozen times a day. Yet even at the present time the locomotive, superb in its simplicity, is followed by a tender on which the painter has exerted his energies to render it as little as possible in keeping with the locomotive, and he even has the sacrilege to carry out his decorative theories by painting the latter as well. A day or two since I saw a locomotive of one of the trunk lines, on which the sashes of the cab-windows were painted a vivid green! It fairly gave me a turn to behold such malicious perversion of art. If there is one feature of railway decoration that is enhanced by absence and more honored in the breach than the observance it is locomotive painting. The artistic locomotive should be absolutely devoid of paint save such unobtrusive coating of the wheels and running gear as is necessary to preserve them from the effects of the atmosphere. The cab should be of plain wood in its natural state and there is even something repellant to me in painting a name and number upon a locomotive. Such designation could be effected by metal letters and figures and the symmetry of style preserved. The tender must of course be painted, but there is no reason why it should resemble a circus-wagon, and elaborate scroll-work is decidedly out of place.

I do not despise the freight-car and do not wish to pass it by when dwelling on the application of art to railway painting—even the humble coal-car deserves a few words

in this connection; but, perhaps unwittingly, these vehicles have always been better treated from an artistic standpoint than the passenger-car. Art must be appropriate and in painting the freight and coal-cars in the simplest and most durable manner the painters were true artists. For similar reasons I do not advocate the painting of sleepers nor the decoration of the rails themselves though such ornamentation would be quite as appropriate as the painting of locomotives.

The growth and development of railway art has been rapid but there is still room for further improvement in decorative methods. While the traveling public are striving for increased speed of railway trains and reduced fares, it may seem rather too exacting to urge that much attention be paid by the railways to the study and application of art, but it should be remembered in extenuation that art is one of the few attainments that are not measured by dollars and cents. As a general truth it may be stated that it is as inexpensive to decorate with taste as without it, and in fact there is apt to be a saving in the former. Art is injured far more by overwork than by underwork, and even in the building of artistic railway stations there is no more cost in constructing a building of architectural excellence than one which is unsightly and defective. Durability, and as a rule, comfort, attend art, and from an economic standpoint the cultivation of the principles of art among their employés in a decorative capacity is a wise course for railways to pursue.

A TRIP SOUTH, FORTY YEARS AGO.

BY WILLIAM S. VEST.

[Written for the AMERICAN RAILROAD JOURNAL.]

IF the thousands of tourists who, seeking for health or pleasure now every winter, exchange the ice and snow of the Northern States for the sun and water-baths of Florida had to encounter the expense, discomfort and vexatious delays always attending the devious route traveled some forty years since, it is more than likely that the land of flowers, with its fragrant orange groves, would be a *terra incognita* to most of them.

In the first decade of railroad existence in this country, all the lines south of Washington were in a rude and imperfect condition. Capital to build and equip them properly was wanting, and with their projectors, cheapness was necessarily the most important consideration. It is safe to say that not a mile of T-rail was laid on any of them. Flat bars of iron, spiked upon longitudinal wooden rails supported on "mud-sills," were in almost universal use. A high rate of speed—with safety to the trains—was not to be expected. Fifteen miles an hour, stoppages included, was about the average attained.

The engines, passenger-cars, and rolling stock generally were in perfect accord with the road-beds. The former were not heavy enough to be effective, and most of them had but two driving-wheels. A storm of sleet or slight fall of snow would cause continuous "slipping," and even a heavy white frost would sometimes cause a passenger train, when ascending a moderate grade, to come to a stand-still. The passenger-cars were most of them dirty and comfortless, and all of them devoid of water-closets, while their seats were so ingeniously contrived as to render sleep impossible. Head-lights there were none, and cow-catchers could not be used, "snake heads" being the rule and not the exception on every mile of track. Spark-catchers, so called, were in use, but so imperfectly constructed that cinders made sad havoc with the eyes and wearing apparel of the unfortunate traveler. Added to these imperfections and annoyances were the frequent changes from one road to another, and the uncertainty of making connections which, if not accomplished, detained unhappy passengers twenty-four hours, one train a day being considered amply sufficient for the limited amount of travel, and for the requirements of the post-office department. No through tickets for passage or checks for baggage could be obtained, each road being independent of every other in this respect.

We will suppose that at the time all these drawbacks to comfort existed, a resident of New York City was compelled to visit Florida on important business—there could be no other possible inducement for going. If a prudent man, he supplied himself with ample funds to meet every emergency, for no accurate estimate could be made as to the cost of the journey until it was ended. We will also suppose that he met with no accidents on the way and that he succeeded in making "schedule time," as it was called, as far as it extended—to Charleston.

Starting then from New York on a winter's morning, our Florida-bound friend could reasonably calculate, after incurring the delays in changing cars at Philadelphia, Havre de Grace and Baltimore, on reaching Washington in time to be carried in an omnibus to the steamboat running down the Potomac River to the creek of that name, some sixty miles distant. So far all had gone pleasantly enough with him; he had experienced no actual discomfort, and a good supper provided on board added to his felicity.

He probably enjoyed a very indistinct view of the venerable city of Alexandria as the steamboat glided by its deserted wharves. No doubt on hearing the tolling of its bell (a performance never omitted when opposite Mount Vernon), he rushed on deck and very likely stared hard at the little he could see of Fort Washington, on the east bank of the river, fully satisfied that he was gazing on the burial place of the great man on the Virginia side. If informed of his error, how natural it was for him to say that —as many others have said—"he was turned round somehow." Let us hope that his patriotic emotion made full atonement for his deficiency in geographical knowledge. Our friend had still time to take a nap of two or three hours before reaching Potomac Creek, and if aware of the troubles he was soon to encounter, he certainly embraced the opportunity.

Arriving at that classic landing-place, he was hurried into a stage and a few minutes convinced him, as it did thousand of others years afterward, that the "sacred soil" of Virginia was not to be invaded with impunity, at least not in that immediate vicinity. The stage-road extended to Fredericksburg, nine miles distant, and such a road! Of all well-known roads in the South, it was deemed the worst, and truly so. In rainy weather, a perfect slough of despond; at all times muddy, rough and dangerous. A Jersey "corduroy" was a macadamized turnpike when compared to it. Dickens tried his best in his American notes to do it full justice, but failed ignominiously; at least our friend thought so when, after three or four hours of

misery, jolted, bruised and fagged out, he reached Fredericksburg. Such mud he thought existed nowhere else in the world, and Burnside's army at a later period, when it made, or rather tried to make the famous "mud march" fully indorsed this opinion.

Fredericksburg is one of the non-progressive towns scattered everywhere in Virginia; it had a population of about five thousand as far back as colonial times; it has that number now and will continue to have for a century to come. To a stranger it has a very unprepossessing appearance; and its houses are sadly in want of paint. Except when discussing politics, including the "Resolutions of '98 and '99" which, by-the-way, they all know by heart, its citizens have a drowsy look. Surely they had, for two or three consecutive days and nights during the late war, noise and excitement enough to make them wide awake for a lifetime.

But our friend had no time to form any conclusions concerning the place. He was hurried on board the train about starting for Richmond; this was his first experience in riding on "hoop iron," as the flat bars were derisively styled, and it was far from pleasant. The track was rough, and the clattering of the car window-sashes rendered conversation impossible; as for sleep, that was out of the question. Four hours afterward Richmond was reached, and by omnibus, our weary and sleepy passenger boarded the train starting for Petersburg. After crossing the James River on the finest bridge existing at that time in the South, he reached that city in less than two hours. Another weary change by omnibus brought him to the Weldon and Petersburg Railroad train which received him on board. After a tedious ride of sixty-two miles, he arrived in Weldon in time to eat a bad dinner and take his seat in the train bound for Wilmington.

Weldon! what an unfortunate reputation that town on the Roanoke River has obtained among travelers; its very name is a misnomer. It was deemed so sickly in summer that whole families, unavoidably detained, have been known to keep awake all night inhaling smoke from a pine-wood fire to avoid the risk of catching the "Weldon fever." Dreary, dirty and depressing in winter, a forced detention of twenty-four hours was justly considered the acme of misery. A week spent in Sing Sing at hard labor would, to most people, be a luxury compared to a residence of the same period in this unfortunate town. It is fair to suppose that our New York friend came to this conclusion, although his stay there was but little over an hour.

The Weldon and Wilmington Railroad had been completed only a year or two before, and had been built at a cost considerably under the estimates. It was almost entirely free from curves, straight stretches for fifteen or twenty miles existing on it, and its length was one hundred and sixty miles. The schedule time to Wilmington was about eight hours, but from defective locomotive power and bad management, this time was not often made, from ten to twelve being about the average.

It is reasonable to conclude that by this time our New York friend had his fill of Southern railroads, but he had only gone half of the distance required to get rid of them. Wilmington was a long way off, and a wearisome ride was ahead of him, and although sleepy and tired, he tried to be in a good humor and to accept the inevitable. When the train left Weldon he had plenty of time to view the scenery by daylight and in his opinion there was not much to admire in it; on the contrary, it had a depressing influence. An endless succession of ghostly-looking pine trees, each of them having a ghastly scar made by the turpentine gatherer, were the most prominent features; and their dull monotony was only relieved when the train stopped at stations to take in wood and water. At every one of these stations, gaunt and hungry hogs sauntered up to the cars, and with their snouts raised the lids of the axle-boxes, and greedily devoured the tallow intended for lubricating purposes. They were all of the "razor-back" breed, a species indigenous to North Carolina. While going through Nash and Edgcome counties, the center of the turpentine country, a few of the natives would saunter on board the cars, bound for Georgia to teach the pine-wood citizens of that unenlightened State, the mysteries attending the cultivation of their own great staple. Physically, they were far from being pleasant objects to look at; clad in seedy home-spun garments, with sallow complexions, our New York friend no doubt thought them the poorest specimens of American citizens he had ever seen. Their only visible baggage were old flint-lock rifles and whiskey jugs provided with the inevitable corn-cob cork. These poor "tar-heels," as they were called, literally "left their country for their country's good." The turpentine having been exhausted on their lands, it was considered worthless. On reaching Georgia they saw good crops of cotton made on similar looking soil, and through them the Edgcome people were induced to plant a little by way of experiment. It succeeded so well, that land in that county rose in value from two to twenty-five dollars per acre, and it is now one of the largest cotton-growing counties in the State; but all this is a digression, and we return to our traveler.

After dark he saw for the first time the brilliant light furnished by the "lightwood" torches, universally in use. They lighted him in to a supper where he fancied every thing tasted of turpentine, and most likely they did, if cooked with pitch-pine, but the natives don't seem to mind the flavor.

And through the dreary hours of night the train went on, one station seeming exactly like the others all along the line; the same gloomy pine trees everywhere. About midnight the train reached Wilmington and our, by this time, utterly disgusted traveler, stumbled down the depot steps, and with a sigh of relief rushed aboard the Charleston steamboat, thanking Heaven that at last a comfortable night's sleep was at his command.

The steamers on the route from Wilmington to Charleston were not built as sea-going vessels. and in rough weather they rolled and pitched fearfully. Cases of *mal de mer* were of course very abundant. The meals served on board were poor, and the sleeping arrangements very slovenly, yet they had one great merit—they never drowned a passenger. During the ten or twelve years they were plying between the two cities, although caught occasionally in very heavy weather, no serious disaster occurred with one exception, and that was the sinking of the *North Carolina* by a steamer of the same line. No lives were lost, but several narrow escapes occurred. Dixon H. Lewis, a noted Congressman from Alabama, was on board the sinking vessel; he was a man of great weight in his own State and in fact everywhere else, for he turned the scale at 600 lbs. avoirdupois. He was rolled in his

night-clothes like a hogshead on the gangway-plank to the rescuing vessel. On reaching Charleston, the fattest citizen that could be found sent him his best suit of clothes to wear until a tailor could furnish him with garments, but it was of no use; the heavy Charlestonian proved to be but an "eagle's talon in the waist" compared to the elephantine M. C. But this is another digression, and the last.

Some time the next day after leaving Wilmington, our passenger reached Charleston, glad to call a halt in comfortable quarters, and very willing to remain in them for a day or two by way of recruiting from the fatigue and loss of sleep incurred by his tedious railroad journey, supplemented by a (probably) sea-sick voyage.

He soon found that there was no way of reaching Florida except by water; inferior steamboats ran at irregular intervals by inland route to Savannah and thence by the same mode of conveyance via Ossibaw Sound to the St. John's River, but there was no way of ascertaining how long it would take for him to reach his objective point. He might be detained in Savannah for a week, and even longer, before a passage could be obtained, and at any rate all was doubt and uncertainty.

When he did reach Florida he found it little better than a wilderness. The long and expensive Seminole war had just ended, and excepting Tallahassee, there were no towns in the State worthy of the name. Stray high-pressure boats navigated the St. John's River, but they were small, very dirty, and some of them dangerous, and boiler explosions were not infrequent. There was not a comfortable hotel in existence.

Such a state of affairs could not be pleasing to any person accustomed to civilized life, and it is to be supposed that when his business was transacted, satisfactorily or not, our friend found his way out of the State as speedily as possible. Most likely he halted at Charleston for a day or two and then, if he had gained wisdom by experience, took passage in a sailing vessel from that city and made his way home by sea.

It was intended to contrast his rough and disagreeable trip with the ease and comfort enjoyed by travelers at the present time, and to give a brief account of the many improvements everywhere made on the present overland route from New York to Florida, but to do them justice would make this article too long. Possibly I may describe them in a future number of the JOURNAL.

FIDELITY INSURANCE FROM A RAILWAY STANDPOINT.

BY JOSEPH E. RALPH.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT is very generally claimed, and with much truth, that railway companies are slow to adopt new things, but to this, as to many other rules there are exceptions. Perhaps no exception is more prominent than the interest taken in the corporations for furnishing *security* for individuals holding positions of trust. The system is comparatively new and its introduction into this country is so recent that I find very few have even a faint idea of its workings; yet there are several companies already doing a fair business, more starting in, and all are looking largely to the railways for support. In the older countries where money is less easily earned, those who must rely on the honesty of subordinates are more apt to demand security; and those that must furnish "bonds" find the number that are willing to risk their savings few and far between. Under such circumstances a corporation that would furnish the needed security at a reasonable rate would be sure of patrons. Within the past few years the conditions of life in the Eastern and Atlantic States have suffered great change; the dash and confidence of America has been subdued by the conservatism of the numerous foreigners, and the institutions bred from the necessities of the latter are gaining a foot-hold.

A few years ago the elected politician, the officer of the new bank, or the recently appointed railway agent or conductor smiled at the suggestion of personal bonds. If that form was indispensable the first acquaintance was asked, and he generally signed the paper. Bonds that were so loosely drawn or executed as to be worthless were common, and the investigation of the standing of the signers was rare indeed. So many losses resulted that a reaction was natural, and the scrutiny of the security is now quite general, and the need has developed the fidelity or guarantee companies.

The railways have welcomed these corporations because they furnished the desired security without any trouble or risk. They give the railway an *ad interim* bond securing it during the time necessary for a proper investigation of the risk, and a reasonable time in which to make another appointment if the first nominee is ultimately rejected. There is security from the start without any trouble or expense for investigating, and the appointee pays the premium on his own bond. The appointed employé fills out an "application" wherein he gives an outline of his life, names those for whom he has worked, confesses to his habits, notes his assets and his liabilities, and if found satisfactory pays a certain percentage, in several installments, of the amount of security furnished for him—generally seven dollars and fifty cents per annum on a thousand dollars.

I see no reason why the railway companies should not adopt the system, but in the experience I have had, I have noted tendencies to injustice and deficiencies that must be remedied before it will become popular with the employés. In the first place many railways are naming a specific company to furnish the bonds for all their employés. This is morally wrong as pandering to the greed of the favored concern, and a very poor business policy for both the railway and the guarantee company as it is sure to engender hard feelings. Any form of security that would satisfy a court or a bank certainly is sufficient for a railway, and if the cost of personal bonds or other security had to be borne by the employés they would, except in very rare cases, soon choose the corporations. The feeling of compulsion I find the most distasteful feature among the men, and no argument will remove it.

The payment of the whole of the premium by the employé is a matter of more than seeming injustice in view of the fact that the railway is the party secured and is being saved the expense of the old system; but as it is the condition of the needed employment, it is generally more a matter of deep thought than loud words.

The naming of needlessly high security for a minimum, or for all positions, is quite too common. When an agent at a salary of about thirty dollars per month, handling but

a few hundred dollars a year and mainly held as an operator, is taxed the same for his bond premium as the agent at three times the salary, and handling ten times the cash, it is simply a case of gross injustice. The guarantee companies would be the gainers in the end if they used their influence to have more fairly proportioned security named.

The examination of the applicants is a serious matter. The thoroughness of the search is commendable, and I judge it is honestly made, but the arbitrary rejection of all applicants that show mere suspicion of wrong, or for some youthful slip that has been atoned for by years of upright life is too much like the old Jewish usages. It is void of all love for fellow man. Some cases that I have met were very unjust. We appointed a very bright man from the freight service to a position for which he proved very well fitted; he worked a revolution in the service at the point and had letters from a number of prominent men speaking well of him. After some months, when all was working smoothly, we were notified that this man was rejected. He had been discharged with a number of other passenger conductors from a road upon the finding of detectives. In his case they admitted they had no proof of dishonesty, but he had been seen several times with loose women, and was *said to gamble* occasionally. We made direct inquiries and found the general outline of the story true, but the writer spoke highly of the man, of the fact that nothing was proved against him, and hoped we would give him a chance. Another rejection was that of a very young operator who was made ticket agent—he had left some country store without proper notice, and the proprietor did not think much of him. The date would show that it was a boyish escapade, and the tone of report would indicate sound sense in leaving the employ of an ill-tempered master. I could name examples in all degrees, but it is not necessary.

The *ad interim* bond that so thoroughly secures the railway has its drawbacks also in the frequent changes necessitated by the rejections. The onus of investigating the nominee being withdrawn, men are put in for their ability to do the work, and many are afterwards rejected for past dishonesty, bad habits, etc., that their letters of reference kindly neglect to mention. If the guarantee companies break up the giving of untruthful letters of recommendation they will be welcomed as a blessing indeed.

My observations of the working of the *ad interim* bond in connection with the average letter of recommendation leads me to suggest a new field for the guarantee companies, viz.: the issuing of certificates announcing their readiness to give security for the party named within certain limits. This would enable the employing railway to know at once that the holder would not be rejected just as he became familiar with his duties, and would save the guarantee company the risk of the term of the *ad interim* bond. The record of every applicant must be investigated whether the cost be repaid by premiums subsequently received or not and once investigated the record of that man is known and available. I would suggest that for a reasonable sum—say a rate of one dollar for each thousand named—a certificate be issued to all that pass the examination, the certificate to hold good for a year from date of issue, and to be renewed for a nominal sum, and the first cost of the certificate to be allowed as part payment of the first premium due when the security is actually called for. I think this would be a popular feature with employers and with employés, and if no source of profit in itself, would at least secure patrons and save part of the present risks to the guarantee companies. Although a warm advocate of the new system, I point out its seeming deficiencies, believing it the surest way to have them removed and greater benefits accrue to all interested.

THE PROSPECTS OF YOUNG ENGINEERS.

THE world buys the services of those whom it wants and who are able to serve it; and the price is settled, like that of all commodities, by the quality and quantity of the thing bought. At the present moment, and for some time past, the supply of young men who have just served their apprenticeship is in excess of the demand. It would be mere waste of time to explain minutely why; but it is principally due to the circumstances that young men have become engineers without asking themselves whether it was likely they would be wanted. Apart altogether from the multiplicity of young men seeking employment, we have to consider what it is these young men can give in return for so many sovereigns per month. This is, unfortunately, the point to which those most interested pay least attention, and it is well that we should dwell on it even at such length that we shall have to reserve the consideration of other questions for another opportunity.

To begin with, a broad distinction must be drawn between the statical—commonly called the civil—engineer and the dynamical—commonly known as the mechanical—engineer. The former has to spend large sums of money with very little regard for the consequences. He is expected to work cheaply in the sense that he gets good value for his money, but the first consideration is that the work shall be done. The result is that a man who can take levels, make a small survey, plot a section, or run out a simple trigonometrical calculation, may be of considerable use in a civil engineer's office; always provided that he is quick, and scrupulously accurate. An inaccurate man will be very dear at any price. It follows that young civil engineers just out of their time would find little or no difficulty in getting employment if only civil engineering work was being done. As it happens, however, that in Great Britain at all events, we are not making in any quantity roads, or railways, or docks, or canals, or bridges, while there are at least fifty applicants for any possible berth, it follows that the case of the young civil engineer is nearly hopeless, and this notwithstanding that he really has professional knowledge of a useful kind, as far as it goes, to sell. The pupilage system is not a failure with him. He learns what is worth money. If he does not get employment it is not because he is ignorant, but simply because the amount of work to be done is limited in quantity, while the supply of labor is overwhelming. Nothing can improve the prospects of the young civil engineer but a large augmentation in the amount of work to be carried out, or a large reduction in the supply of engineers—such as might be brought about perhaps if young men carefully eschewed the business for fifteen or twenty years.

If we turn now to the mechanical engineer, we find matters on an entirely different footing. The mechanical engineer is a manufacturer. He may make lace machines

or power looms, or steam engines, or turbines; but there is no difference between him and the cotton-spinner, or the weaver, or the pottery-maker. We know that it is the custom to put the mechanical engineer on a much higher footing than the lace-maker, let us say. He is regarded as more scientific, more professional, so to speak. Perhaps so. It is not worth while to go into this matter. The broad fact remains that he makes things which he sells, while the civil engineer does not. Now the manufacturer knows that the making of the thing sold is only part of the business of his life. He must make and sell at a profit, and no amount of engineering skill—using the words in their abstract sense—will enable him to do this. He must know how to buy everything he wants in the cheapest and sell in the dearest market, and he must know how to cut down the cost of production to the lowest possible limit. This is not peculiar to engineering. Such things cannot be learned from books; they are not taught at science classes, and the ordinary pupil never learns them at all. The mechanical engineer who employs young men estimates their worth by what they can do, and he knows that, as a rule, they can do very little. Let us consider for a moment what a man who has served his time in the shops of a good firm, passed through the drawing-office, and studied science, can give in exchange for a salary. He is an indifferent fitter, worth, say, £1 a week; he can run a planer or a shaping machine if the work is fixed for him, as well as a boy of sixteen who has been brought up to run planers and nothing else. He can do a little at the lathe, but is not to be trusted with really accurate jobs. He is a fair draughtsman, in the sense that he can put lines neatly on paper, and can use a box of colors with some judgment. He knows a good deal about the theory of the steam-engine. He can calculate volumes of air from weights, pressures, and temperatures. He can tell one end of an indicator diagram from another. He has more than a smattering of algebra, and the first six books of Euclid are at his fingers' end. He is a fair arithmetician, and possibly knows something of electricity, magnetism, and chemistry. This is about the sum and substance of his attainments. How far are they likely to be salable? how much are they likely to fetch in the market? The list of what he does *not* know would be much more extended. We shall not attempt to reproduce it. It will suffice to point out one item. He cannot, for the life of him, tell what anything he makes or sees made, costs, or ought to cost. He is totally unable to make even an approach to an estimate. Take him into the yard in which he has worked, show him a fly-wheel, and ask him what it weighs, how much pig iron was needed to make it, what the coke that melted it measured, how long it took to turn and bore it, and it will be found that he knows none of these things. Put him in the drawing-office, give him an old engine then in the yard to rebuild, and see how he will set about it. How much of the old work will he bring in? How many new patterns will he want? Test him in any possible way connected with manufacturing for a profit, apart from abstract scientific engineering, and he will be found utterly ignorant, and being ignorant he is practically useless to the engineer outside a very narrow groove, and yet he expects to find plenty of employment at a good salary. There are pupils who are exceptions to this, and our experience goes to show that such men never want employment for any length of time They may not be paid all they are worth, but they do not pronounce their lives a mistake. So long as they have health and strength they get work. Such are the men who get into valuable partnerships, or ultimately assume high positions. But, as we have said, they are exceptions to the general rule.

It will be found, and we say it with regret, that one reason why so many men are failures as engineers, is that they do not take salable goods to market; and this opens up a very large question indeed. The question is one of education, the consideration of which we must reserve. We must, however, before taking leave of the subject for the moment, say that enthusiasts are running the risk just now of teaching young men intended to be engineers a great deal that has no direct money value whatever. Unfortunately far too exalted an idea has been formed of the worth of so-called science to the steam-engine maker, let us say. All the science in the world would not keep him out of the bankruptcy court unless he can sell engines for more than they cost him to make. We are not deprecating the teaching of science; we only insist that, in practical mechanical engineering, science does not of necessity mean money. We often hear German and French engineers extolled for the results of their scientific training. What are the locomotives or marine engines which have resulted from it like? The Americans have been the least scientific engineers in the world; yet they have modified engine-building practice all over the world. Germany and France have been unable to compete with us without buying engines from us to copy. Science may prevent a man from making enormous mistakes; it cannot tell him how to produce even moderate commercial successes. Standing alone it is entirely helpless in commercial mechanical engineering—combined with sound practice it is useful. How and why some pupils learn the commercial part of the business, while others do not; and why some men have better chances of success than others, are points which we shall deal with at a future time. We have said nothing, however, which any employer of labor, any practical mechanical engineer, will refuse to allow. Unfortunately one of the first things the pupil discovers when out of his time, is that, according to the world in which he seeks employment, he has really learned to do nothing which is worth substantial remuneration; and all the while employers are at their wits' end to get really good and valuable men.—*The Engineer* (London).

CAN WATER BE USED AS FUEL?

CAN the hydrogen contained in water be released from the grasp of the forces which hold it in that form, and can its intense heat in combustion be economically utilized? Ever since the discovery of the properties of that element over 100 years ago this has been recognized as a problem whose successful solution would lead to economic results of incalculable importance. As its weight is more than fourteen times less than that of air, and as about one-ninth of the weight of all the water on the globe is hydrogen, it will be seen that the volume of the gas, if it should resume its separate form, would almost fill the spaces of the visible universe. The quantity is immeasurable. The heat produced by its combustion is more intense than that given out by any other form of matter. The discovery of some cheap method of unloosing this gas from the oxygen which holds it would change every lake into a coal bed

and the ocean into a reservoir of fuel sufficient for the endless generations of mankind. Whether our coal measures are inexhaustible or not would then become a question of no importance.

By subjecting steam to from 6,000 to 10,000 degrees of heat, the hydrogen and oxygen of which it is composed become separated. If steam be passed through a tube containing iron filings, heated to only 1,400 degrees, the oxygen will separate from the hydrogen and go to the iron filings, leaving the hydrogen free. If silver filings are used the heat need not exceed 1,000 degrees. These methods, however, are, of course, too expensive and too complicated for practical use.

It is claimed, however, that by the use of naptha the oxygen and hydrogen in the vapor of water can be dissociated and the hydrogen set free at small cost and in any quantity required, Many visitors to the late railway exposition will remember Dr. Holland's locomotive which stood in one of the stalls with steam kept continuously at the working pressure by means of an apparatus in which it was claimed the fire was produced by the combustion of pure or nearly pure hydrogen, and that the gas was produced from water by the use of naptha. Undoubtedly the prevalent theories are at variance with the claim that heat can be economically produced by this means, and probably many scientific men, without investigating the subject, would insist that there is no hydrogen set free from the steam used. The law of the conservation of energy is now as thoroughly established as the law of gravitation, and it is argued that, under this law, it will require as much heat to unloose the hydrogen from the water as is produced by the combustion of hydrogen with the oxygen of the air to make water—that substance being produced, as everybody knows, by such combustion. In other words the theoretical scientist says that one must use as much heat to produce his hydrogen as he can afterwards get from it, and therefore he gains nothing. To this those who believe in the naptha-water fuel reply that while to dissociate the oxygen and hydrogen in steam by heat alone may exhaust as much thermic energy as would be produced by burning the hydrogen, yet if silver filings are used only from $\frac{1}{6}$ to $\frac{1}{10}$ of the degree of heat is required to separate the two gases; and they claim still further that by the use of naptha vapor the separation is effected at a still less degree of heat. They claim that the oxygen in steam will leave the hydrogen and join itself to the carbon in the naptha vapor, setting free the hydrogen in both the steam and in the vapor of the hydro-carbon at a comparatively low temperature. In other words it is asserted that by mixing the vapors of water and of naptha at the temperature at which steam is produced, the hydrogen in both is set free ready to be used in producing the most intensely hot flame known to science. How hot it is may be judged by the fact that while one pound of alcohol has a heat-making power of 9,982,890 foot pounds, a pound of hydrogen has a calorific power of 47,888,400 foot pounds. While it is admitted that as much energy is required to separate the hydrogen and oxygen in steam as is produced by their combustion, it is claimed that a large part of this energy manifests itself in a different form from that heat —probably in the chemical process by which carbonic oxide is formed.

It will be seen that the process of producing and burning hydrogen in the furnace of a locomotive from the vapors of water and naptha is radically different from that of using naptha or petroleum as a fuel, a desideratum which many inventors have sought. Mr. Herman Haupt, the well-known engineer and railway manager, made very extensive and careful experiments with petroleum as a fuel for locomotives while connected with the Northern Pacific, and afterward published a letter relating to the subject in the *Railway Age*. Petroleum is said to be in regular use for locomotives on some Russian railways, but we have no sufficient data as to conditions and results to enable us to determine the measure of success attained. —*Railway Age.*

RAILWAY GARDENING.

"L'ALLEGRO," the well-known railway writer, has the following remarks on this subject in a recent number of the *Derbyshire* (Eng.) *Times:*

"One would scarcely think that the subject of Railway Stations was one capable of being treated in any but an utilitarian manner. Yet, on looking about me the other day at Bakewell, I became conscious of another element. The man who designed the pleasing floral and other effects on either side of the line there had taste, if not poetry in his soul.

> "No poetry in railways! foolish thought,
> Of a dull brain, to no fine music wrought.

"The name of the station and directions as to the features of the district, etc., are effectively shown by the aid of bits of spar or pebbles, and beds of flowers and plants are disposed as artistically as any to be found either in public garden or private pleasaunce. On the Midland system, so far as I know, Cheltenham and Gloucester 'bear away the bell' from an horticultural view-point. Both are old stations, and cannot in themselves be called beautiful. Yet abundance of flowers, mantling greenery formed of delicate creeping plants, and cool banks of ferns have effected a metamorphosis that is refreshing beyond measure, especially in this sultry weather. While in the 'West Countrie' I should not omit reference to Ashchurch, whose claims in this connection are considerable, as travelers by the Midland Railway Bristol-wards will readily admit. Returning to the Derby and Manchester line, stations other than Bakewell—Duffield, Belper, and Cromford to wit—are very tastefully set out. I trust the pretty practice will become more general.

"The hours of duty of railway servants are occasionally both long and monotonous. Although the time of such men may not be fully taken up by actual work, it is essential that they be on the spot. Why not then encourage them to devote their spare moments to transforming into flower-beds the frequently very unlovely surroundings of their particular stations? Stoppages at country platforms would then become less irksome to the impatient traveler, and the stations would no longer be considered as so many mile posts to be welcomed only as their decreasing number indicates the approach of the journey's end. The diversity of style and coloring in the designs, which could not fail to make itself apparent where the men were left to their own devices, would be as exciting to the curiosity as it would be pleasing to the eye, and thus the stoppage at a station would be looked upon not so much a hindrance as an opportunity for observing the different effects to be produced from the same materials according to the

varying tastes of the designers. The charming change from the rapid headlong flight of rails, posts and trees to the quiet survey of bright and many-tinted flowers and ornamental shrubberies would be as welcome an experience as could well be wished. Let us hope that if we cannot have the embankments all along the line utilized for the growing of fruits and cereals, turning them into a veritable garden of the Hesperides, as was suggested, but found impracticable, some time ago, our railway stations at any rate may be rendered more beautiful; that in the summer months at least, as Spenser quaintly hath it,—

> "No daintie flowre or herbe that grows on grownd,
> No arbarett with painted blossoms drest,
> And smelling sweete, but there it might be fownd,
> To bud out faire, and throwe her sweete smels al around.

"On the Great Western line, from say the Rossett, near Chester, nearly every station up to Paddington is enlivened and beautified by beds of flowers and ornamental rockwork. The embankments, etc., in the vicinity of many of the Scottish railway stations also are laid out in the most perfect style of horticultural art. Especially is this the case on the Caledonian Company's romantic route from Callander to Oban. Remarking this pleasing feature to the courteous representative of the railway company named when at Oban last autumn, he informed me that the principal officers of the northern section of the line subscribe to a common fund which has for its object the encouragement of this laudable practice. A holiday tour of inspection is made annually, and out of the fund prizes are awarded to those stations which in the opinion of the judges display most originality of design and effectiveness of grouping. I must, however, not omit to mention that a somewhat similar custom obtains on one or two sections of the Midland Railway, and that one of these is the Derby and Manchester line. I have dealt thus lengthily on this delightful theme, because I—and I doubt not my readers will agree with me—would have the examples I have cited followed wherever practicable."

Railroad Sanitation and Cholera.

MR. W. J. SPICER, general manager of the Chicago and Grand Trunk Railroad, has issued the following important special circular concerning sanitary inspection:

"The Secretary of the Illinois State Board of Health, in calling my attention to his recent circular addressed to the local health officers and municipal authorities regarding the importance of making thorough preparation for the possible advent of cholera, writes me as follows:

"'It is desired, as one important step in the general sanitary movement already inaugurated, that all railway stations, depots and the grounds surrounding the same be put in the best obtainable sanitary condition, with special reference to water-closets and privies; and to the character of the water supply for the use of employés and passengers. The same supervision should also be extended to passenger-cars, in the points specified. Accumulations of stagnant water, or the flow and seepage of foul drainage in the vicinity of human habitations are always injurious to health; but during a cholera epidemic they are especially dangerous. So far as such conditions obtain, as the results of embankments or road-beds, they should be remedied as speedily as possible.

"'The preservation of public health, whereby, among other things, interruption of travel and traffic may be prevented, is a matter in which common carriers and the general public have a community of both interests and duties.'

"I trust that every one will realize the importance of doing everything possible for the preservation of health. No excuse will be accepted for any want of cleanliness about station premises, yards, platforms, closets, etc. All employés having the care and supervision of property will, upon the receipt of this circular, make a thorough inspection of all buildings, outhouses, yards, grounds, etc., of this company, in respect to: 1. The condition of the water supply. 2. The disposition made of night-soil, garbage and sewerage. 3. The cleansing of yards, tracks, grounds, etc. Water is one of the commonest mediums through which cholera spreads. Hence the necessity of protecting the supply from contamination by surface drainage of filthy premises or seepage through the ground from privy-vaults and cess-pools. Night-soil, garbage, sewage and all forms of decomposing vegetable matter are highly prejudicial to health, and should be destroyed by disinfection. A frequent sprinkling of dry earth down the vaults of closets will have a good effect. Closets and urinals in passenger-cars must be kept quite clean at all times. Special attention should be given to cleaning car floors and the thorough airing of cars at the end of each trip and before further use. You will call the attention of the public authorities to all filth and unhealthful condition of property adjoining that of this company, and so situated as to affect the healthfulness of this company's premises. I am sure that all agents and all employés generally will cheerfully and vigorously coöperate in efficiently carrying out these directions."

Operations of English and American Railways.

THE method of accounting and general practice of operating adopted by American and English railways is different in many respects, yet they are so nearly parallel that a comparison of results is interesting and instructive. In the following table are found the main items of capital, earnings, expenses and general results of the railway systems of the United States and of the United Kingdom of Great Britain for the year 1883, as follows:

	United States.	United Kingdom.
Total mileage	120,552	18,681
Stocks and bonds	$7,163,100,966	$3,814,718,575
Do. per mile	59,409	204,203
Passenger earnings	206,837,256	143,412,442
Per cent. of total	25.10	41.53
Freight earnings	549,756,695	188,108,410
Per cent. of total	67.9	54.46
Miscellaneous receipts	67,178,873	13,861,779
Per cent. of total	11.0	4.01
Total receipts	823,772,924	345,382,631
Do. per mile of road operated	7,460	18,327
No. of passengers carried	312,686,641	683,718,137
No. per mile of road	2,832	36,600
Tons of freight carried	400,453,439	258,000,000
Tons per mile of road	3,635	13,800
Operating expenses	486,861,040	181,411,221
Do. per cent. of receipts	59.10	53.00
Net receipts	336,911,884	163,791,420
Per cent. on total capital	4.70	4.29

The total road operated in the United States last year included only 110,414, and the calculations of mileage results is based upon this total length of line. Notwithstanding the amount of water popularly supposed to have entered into the stock of American roads, the total capital per mile is considerably less than one-third of that of the English roads. But the roads of the United Kingdom are more substantially laid as a whole than even the best

roads of this country, and their equipment to accommodate so large a traffic per mile is much more extensive. In the cost of English roads, right of way and terminal grounds are a heavy item of expenditure, while here these items have been comparatively light. Passenger traffic upon the English roads is heavier than on those of the United States, and tonnage per mile of road operated is nearly four times as great as that upon ours. This result follows from the dense population of Great Britain, and the sparsity of people found in a large portion of territory through which our roads extend; but the net result shows that capital employed in American roads brings a better return than that invested in the railways of Great Britain.

For obvious reasons, the tonnage and passenger traffic of American roads show a larger annual increase than those in England, and this increase in traffic involves a continual expenditure of large sums for betterments, equipment and additional facilities. As traffic increases, a better road-bed, more rolling stock and additional terminal facilities are demanded, resulting in continual outlays that increase capital accounts in advance of the growth of earnings. It is quite possible that for these purposes the total cost of American roads in the next ten years will be increased at least twenty per cent. to meet the growing demands of traffic, even should there not be a single line of new road laid. As a whole, our railways are light structures compared with those of England, yet they are sufficient for the use required of them. Their cost increases with the growth of traffic, and when our railways shall have arrived at the maximum of capacity and capitalization the amount of water that may have been incorporated in their stocks will be found after all to be only a moderate proportion of the total sum.—*The Stockholder.*

Illumination of Passenger-cars.

THE *Electrical Review* notes that a large party of representative railroad men from all parts of the country met at Altoona, Pa., recently, in the yards of the Pennsylvania Railroad, where a train of eight passenger-cars was in position, each one having a different kind of light. The first car was illuminated by ordinary coal gas; the second by the same quality of gas, with gasoline added to enrich the flame; in the third car the Lipsey burner, using the same enriched gas as the second car was used. The globe of this burner throws the light down, as well as a very considerable amount of heat, and looked like a Siemens' burner upside down. The illumination, however, was very good; in the fourth car the Siemens' burner was tried, supplied with the same kind of gas, but, owing to the location of the burners on the lamps, it threw a very distinct shadow on the floor of the car and on the seats. The fifth car was lighted with the oil-gas system used by the Philadelphia and Reading road for several years. The light was about the same as the ordinary gas-light. The seventh car had a gas made from gasoline, using an Argand burner, which made a beautiful light, and which is promised to be perfect on the application of several new principles by its owners. The last car was beautifully illuminated by the Brush electric light from a storage battery. The simplicity of the whole lighting apparatus, together with the excellence of the light, made the electric display the best of all. The gasoline used was rendered perfectly safe, in the event of accident, by its application.

Dr. Dudley, the chemist of the Pennsylvania Railroad, gave an interesting lecture on the several lights used, and said that the electric light was the coming light for railway use as soon as the subtle fluid could be generated as fast as exhausted. The doctor was kept busy answering the numerous questions from all sides on the durability and strength of the different lights.

South Australian Railways.

A DISCUSSION has been proceeding with reference to the construction of a railway from some point on the Great Northern Railway of South Australia to tap Southwestern Queensland and a part of the Southwest of New South Wales, but particularly the former. The matter has been referred to over and over again in the South Australian Parliament, and there is a general conviction that a line must be made. The difficulty is what route should be adopted. On this point a controversy has been going on for months between persons of opposite opinions, both sides claiming equal knowledge of the country and equal disinterestedness. Two routes have been suggested. Along one a survey has been made, and by that survey one section of disputants are prepared to stand. The other side suggest a different route, which is now being surveyed.

ON all European railways there are first, second and third class fares for passenger traffic, the third-class fares yielding the largest margin of profit. During the last ten years the rates have been generally reduced, and it has been found that the reduction has invariably increased traffic enormously, even peasants, who formerly did not dream of traveling, indulging in the luxury of riding behind the iron horse.

THE railway system in Ohio has cost more in building and equipment than that of any other State. It may be compared in millions of dollars with the other important States, as follows: Ohio, 825; New York, 808; Illinois, 588; Pennsylvania, 471; Missouri, 308; Minnesota, 307. The railways of these six States cost as much as all the rest of the railways in the United States.

A BILL is before Parliament (and thought likely to pass) which will give the English Railway Commission the powers of an ordinary court of law, limited to its special sphere. This commission has not been a wonderful success, but it certainly has done good enough to justify fully its establishment. Compared with the State commissions in this country it is admirable.

THE railways of India appear to have got beyond the experimental stage in the use of steel ties. In a recent parliamentary debate the fact was brought out that the directors of the Southern Mahratta Railway Company last year bought 99,600 steel ties from a Belgian firm.

THE new railroad cuttings about Bergen Hill, N. J., have opened large deposits of odd and rare minerals. They are continually visited by mineralogists and students from scientific schools.

A LETTER FROM THE INTERNATIONAL ELECTRICAL EXHIBITION.

[EDITORIAL CORRESPONDENCE.]

PHILADELPHIA, September 13th.

FROM an artistic and scientific point of view the International Electrical Exhibition now being held in this city is an unquestionable success. The buildings are spacious and the attendance large, and at night the scene is singularly beautiful. Thousands of electric incandescent lamps shed a rich flood of light through the galleries and corridors, and a fountain in the center throws jets of spray each illuminated by many-colored lamps whose rays follow the direction of the water. In the "annex"—the old Pennsylvania Railroad station—a lecture room is provided on whose walls are maps of the submarine cable systems of the world, and in this apartment an excellent orchestra plays every afternoon and evening while the morning is devoted to scientific lectures. The exhibits are rapidly filling up and the vacant spaces grow fewer daily. There is a conspicuous and agreeable absence of anything approaching the "cheap John" order, and it is evident that the management has given what the name implies: an International Electrical Exhibition. No exhibits are permitted that do not either directly or remotely derive or generate electricity as a force.

None the less is the exhibition disappointing. Disappointing to one who like myself regards electricity as the power of the future, and looked forward to the exhibition as an exponent of the marvelous in electrical achievement. From this point of view there is confessedly a disappointment. In the great and powerful steam-engines there is the constant reminder that electricity—the electricity of commerce—is but a reproduced force. The dynamo electric machines are beautiful and very powerful but back of them is the still more powerful steam-engine absolutely necessary to the revolution of the armatures and the consequent generation of the subtle fluid. Dynamos of great power are here, but to operate them, steam-engines of still greater power must first be set in motion. There is an inevitable loss of power in the transmission and we are confronted with the old, old truth that the created is ever inferior to the creator. We are forced to conclude that the key to the mystery has not yet been found. Electricity cannot yet compete with steam, and the day is far distant when the electricians can claim independence for their power. When for the purposes of generation the two natural forces, wind and water, can be made to furnish an abundant and inexhaustible power, then indeed may we look for the electric era; but judging by present results that time is in the distant future. The International Electrical Exhibition demonstrates most clearly that we have attained but the rudiments of electrical knowledge, and that well-nigh all recent investigation has been directed more to the adaptation of the known rudimentary principles than to creative discovery. Still, from this very ignorance we can take fresh heart. If with the little electrical knowledge yet obtained—learned, it must also be remembered, in little time—so much can be accomplished, the future opens to us a boundless field of possibilities. The difficulty is that the world has apparently begun at the wrong end of electrical research and studied the application of electric force before the problems of its generation.

Up to the present time, as judged by the exhibits, the chief, if not the only practical result that has been perfected, is the application of electricity as an illuminating power. One general glance upon entering the Exhibition Hall demonstrates that electric illumination is the chief exhibit, and it is a grand one. Here at least we can immediately realize benefits. There has never been a building so superbly illuminated as the Exhibition Hall is today, and the light is simply perfect. There is no glare, and an absolute steadiness about the perfected incandescent electric lamp, while a softer, mellower tint could be imparted by nothing but our solar luminary. The Edison and Weston systems of electric lighting have extensive exhibits, while the exhibit of the Brush system is not yet completed to a point that would permit of just criticism. As between the methods of the former two systems an impartial judge would, I think, award the palm to the Weston. The quality of the light is not appreciably better, at least to one who is not a professional electrician, but the dynamo machines are less cumbrous and certainly superior in workmanship. I was shown a Weston dynamo which was stated to be capable of the same results as an Edison dynamo that outweighed it a dozen times. The capacities of these two dynamos were stated to be fifteen hundred incandescent lamps each, and after viewing the smoothness of their workings and the wonderful brilliancy and steadiness of the light produced, the on-looker is apt to view the first gas-jet he subsequently meets, with the mingled awe and superiority that youth is wont to exhibit to age. Gas, he considers, has about run its race, and while it has been a tyrant for nearly a century, it must spend its few remaining years in due humility.

In other departments of the exhibition there is little novelty save in the application of electricity as a force or its generation as a result. There are various machines run by electric motors, but their accomplishments as mere machines do not strike one with much interest. The fair sex gather in numbers to witness the operation of sewing machines run by small dynamos, but the sewing is the same as that accomplished by our mothers in days gone by. In the "annex" there is an ingenious brick-making machine which registers the number of bricks made by means of an electrical register in the main building, but I must confess that the general public is far more interested in the mechanism of the machine itself than in its one electrical feature of registering. And this is a fair example of the difficulties of rendering the exhibition interesting from a purely electrical point of view. The action of the electricity is hidden and the work-a-day people are chiefly interested in that which can be seen and handled. They are surprised at the accomplishments of electricity but the action of the dynamos is so simple that there is but little to look at in them. On the same plan there is a Roosevelt organ in the gallery of the main building which is played by electricity. the performer sitting at a key-board a dozen yards from the instrument; but the real interest of the performance—the electrical transmission from key to pipe—is hidden from view and the public must perforce either watch the performer or the organ, and neither are very thrilling spectacles. The United States War Department and the Ordnance Bureau have exhibits, but neither are very interesting. They

form good pictures of "still life," for the articles exhibited are in a state of quiesence and seem likely to remain so. A feature of the exhibition, and one which attracts considerable interest is a Cottrell printing press run by a small Daft motor, on which is printed the *Electrical World*, an interesting and prosperous weekly journal, now in its fourth volume, devoted to the progress of electrical research and application.

Of course there are extensive exhibits of telegraph and telephone systems, and the display of synchronous and multiplex telegraphic instruments is very extensive; but as before stated, the public cannot view the action of the electric spark, and there is very little surface-interest, so to speak, in the mere instruments themselves. To a greater or less extent nearly all of the exhibits are open to the same objection: they are of great interest to the electrician and are examples of the varied and useful application of electricity as a force; but to the public they seem but old devices operated by new methods and therefore fail to attract marked interest.

From a strict railway standpoint there is a surprisingly small number of exhibits bearing directly upon railway interests, but though few, these exhibits are among the most interesting in the whole display. I had hoped to see exhibits of electric head-lights for locomotives and of systems for the electric lighting of railway cars, but as yet there is nothing exhibited in this category. Neither, strange to say, has there been any exhibit tending to demonstrate the practicability of electric propulsion. There is, indeed, an insignificant little corner where a few yards of track are laid for the purpose of running an electric car, but the exhibit is not completed and under no circumstances can approach what such a display should be. The general impression of this exhibit is that of trifling with a most important subject. In the "annex," however, a practical railway man can find several interesting exhibits, and these are conspicuous for the fact that they are also interesting to the public from a mechanical point of view. The Union Switch and Signal Company of Pittsburg, have a very extensive exhibit of their various railway signal devices which are illustrated with accurate models. The Wharton Railroad Switch Company of Philadelphia, likewise have an interesting exhibit of the Hall Interlocking Switch System which they control, and it would be difficult to find a more complete and satisfactory electric switch and signal system than is here furnished. One of the most novel railway signal systems is also on exhibition in the complete model of the railway cab electric signal exhibited by the Railway Cab Electric Signal Company of New York City. This signal system differs from others in use in giving the signals in the cab of the locomotive either by means of a bell or whistle, an electrical circuit being maintained from the locomotive to the rail and thence through the tender back to the locomotive for the purpose of operating the signal.

The exhibition has had an additional interest this week from the fact that the United States Electrical Conference has been in session here. The attendance at the conference was large, and the last session will be held to-day.

Altogether the Franklin Institute, under whose auspices the exhibition is held, may be congratulated upon the success of its enterprise and undoubtedly the impetus given to electrical research will be great. And this, despite the disappointment I have spoken of, for this disappointment is wholesome. If a visitor to the exhibition is at first tempted to exclaim, "How much the world knows!" he will shortly realize the aptitude of the more humble exclamation: "How much the world has to learn!" And it is this realization of comparative ignorance that will be far greater in its effects than the most extravagant pride in the achievements of American electricians. The exhibition is rather an indication of the "to be" than of the "is," if I may be pardoned for the use of such metaphysical expressions. It is an indication of what we have to learn and accomplish rather than a display of present results. As such it should make us truly wise, for it is well said that wisdom is but the realization of ignorance. Calmly viewing the display, I should say that the problem of electric illumination has been fully solved, but that in other branches of usefulness electricity is as yet an infant. That it is meeting with a rapid and healthful growth is evident, and with this we must be content for the present. The exhibition will, I think, have one marked and beneficial effect, and that is to direct more attention to the problem of electric generation than to its immediate application.

It only remains for me to add that the management extends every facility to those seeking information and treats representatives of the press with great courtesy. Those having charge of the exhibits also manifest every disposition to enter into explanations when desired, and the whole exhibition is imbued with a spirit of dignity befitting the high character of its motives.

J. BRUEN MILLER.

FUN ON THE RAIL.

THE unintelligibility of a brakeman's call when announcing a station is proverbial. The other day, however, one called this station plain enough. There was a sheriff on the train with some prisoners for the penitentiary, and upon announcing the arrival here the brakeman said: "Yuma! Change clothes; ten years for refreshments!" —*Yuma Sentinel.*

WHEN a Mexican feels aggrieved because a railroad company has not sent him a pass, he just goes out and pulls up a few rails. This is a great deal more sensible than moping around and grumbling for six or seven days. —*Burlington Free Press.*

"WHY is a woman always too late for the train?" asks an exchange. Because she isn't. Pretty often she is nearly an hour too early for the train, and runs several blocks for fear she will miss it.—*Norristown Herald.*

A CONDUCTOR on a railway used to pass his mother free; but he was discharged from service, and his younger brother asks: "Who will car-fare mother now?"—*Exchange.*

"THE dog came for me," said the tramp, "and I played I was a railroad contractor." "What did you do?" "Made tracks."—*Rochester Post-Express.*

IT is a singular misnomer to call ticket-brokers "scalpers." Though they may slaughter rates they never attempt a raising of fare.—*Exchange.*

A WESTERN paper announced a railway disaster recently with the heading, "Boiler Empty and Engineer Full."

American Railroad Journal.

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NEW YORK, SEPTEMBER, 1884.

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ONCE MORE.

ONCE more we would remind our readers that the AMERICAN RAILROAD JOURNAL is the only railway magazine and review published, and that in our endeavors to continue successfully in this particular branch of railway journalism, we seek coöperation from them. Since the inauguration of our new policy in the June JOURNAL we have published seventeen contributed articles on various subjects of interest to railway and tramway officials, managers and employés, and they have met with marked favor. Our staff of contributors is steadily widening but there will always be room for interesting contributions from whatever source they may come. The sole requisites are that they shall be well-written, appropriate to the character of the JOURNAL, and original in their treatment. For all such contributions we have a steady demand and for them we pay a good price upon publication.

Once more we urge our readers to recognize in the fact that the JOURNAL is the only publication of its class, a claim for their active support, with the full assurance that with this support we will be enabled to enlarge our field of usefulness, bearing in mind the fact that the laborer is worthy of his hire. We do not ask nor do we wish gratuitous assistance of this kind, for we act upon the principle that an article good enough for publication in our columns is too valuable to be given away by its author.

WHAT WE THINK OF IT.

WE have received a number of letters requesting our opinion of an organization located at Youngstown, Ohio, and calling itself the "Railway Invention Bureau." Our inquirers were chiefly inventors of railway appliances who are in doubt as to the expediency of participating in the operations of the Bureau and seek information relative to the nature of the organization and the character of the men controlling it. After a thorough investigation we are compelled to state that the Bureau does not appeal to us either as a useful or as a particularly beneficent organization. As far as learned the character of its members is good and we will therefore assume that its dealings are scrupulously fair, but none the less does it seem as if the Railway Invention Bureau is not an organization destined to achieve practical success.

The Bureau is stated in numerous circulars to be a branch of the "Humanitarian Invention Association," and having thus laid claim to philanthropy it must be viewed from a philanthropic standpoint. Had it merely claimed to be a business organization designed for the legitimate profit of its promoters and managers, such examination and criticism would be manifestly unjust, but as it appeals to inventors in the guise of beneficence it must substantiate this claim or else receive merited criticism.

The prospectus of the Bureau reads well and of course the advantages offered by the organization to both railway inventors and to railway mechanics and car-builders and the like are conspicuously enumerated. The Bureau claims to have the services of well-known railway officials and experts who will test the value of each invention submitted; and provision is also made for procuring and controlling the patents thereon. Mechanical errors are to be pointed out and the inventors will be given hints as to the best means for overcoming these difficulties. All this sounds well, and did the Bureau lay no stress upon its philanthropic character, criticism would be disarmed save as to its practical benefits. We will consider these later, but the first question to be determined is whether or not the Bureau may be justly deemed a branch of an "humanitarian" association. We should say it could not in view of one of its chief provisions, which is to the effect that an examination fee "not exceeding $25 in ordinary cases" is to be paid by the inventor before the Bureau will examine his device.

Here seems to be the milk in the cocoanut. It would be an easy thing for the Bureau to state that it would give every invention submitted a cursory glance with a view to determine its palpable merits or defects, free of charge or for a trifling sum demanded as an earnest; but the examination fee in *all cases* is placed at a good figure and there is no distinction drawn between inventions whose impracticability will be determined at the first glance and those which will require considerable examination and trial to determine their utility. At the very lowest estimate, at least seventy-five per cent. of railway patents could instantly be deemed practically valueless by any railway official at the first glance and fifty per cent. of the remainder could have their usefulness demonstrated without a further test than the models offered. Thus on this remarkably low estimate, but one out of every eight railway inventions would require a practical test, and at the rate of $25 for every invention examined, the average expense of every practical test under the supervision and by the methods of the Bureau would be at least $200. Probably those inventions that would be deemed worthy of being practically tested do not come under the head of "ordinary cases," and as there is no maximum fee given we are in doubt as to the precise tax over and above $200 to which the fortunate invention would be subjected.

We fail to see any great beneficence in this system of examination. We are not saying that this cost would be very excessive, for it often occurs that practical tests are most difficult to obtain; but we do say that were money-making individuals to adopt a scheme of this sort and conduct it honestly too, and at these figures, it would prove a very profitable undertaking, and there would be no call for them to lay claim to beneficence or philanthropy.

Concerning the practical benefits of the Bureau we shall consider them in precisely the same light as we would were it an ordinary business concern operating for honest profit. After a careful examination of the prospectus we doubt if the Bureau could ever prove of practical benefit to either railway officials or to inventors. Any practical railway man could judge of the merits of an invention without the necessity of having it tried before a board of examiners. From what we know of the opinions of railway mechanics, car-builders and road-masters, we feel sure that as a class they will not avail themselves of the benefits offered by the Bureau in the inspection of the thousand and one inventions that accumulate from year to year. Among the names of the Board of Managers of the Bureau but one is familiar to us as that of a practical railway man, and the others we understand are those of men in other walks of life, the President being a clergyman; and just wherein these gentlemen are competent to offer great advantages to railway inventors we fail to see.

As was remarked by a recent contributor to our columns those inventors who have patented *valuable* inventions may be sure of reaping a reward, and it is a mistake to suppose that railway officials are slow to examine really meritorious devices. If they show reluctance to examine with minute thoroughness any invention that may be submitted them, the inventor might as well make up his mind that the fault lies not with the railway officials but with the invention. All the Invention Bureaus in the world cannot make a poor invention good, and as far as mechanical errors are concerned, any competent railway official will be only too glad to suggest means for overcoming them if the ultimate value of the invention would be thus obtained.

The Railway Invention Bureau may be, and doubtless is, an honestly conducted concern, and its managers may be men of intelligence and discretion; but we respectfully assert that the Bureau appeals to us neither as a philanthropic, practical, nor useful institution.

PROTECTING A MONOPOLY.

UNDER the above title, the following extract appeared in the New York *Times* of September 1st:

There is a complaint among many railroad people and brokers that the decisions of the Committee on Stock List of the Stock Exchange in regard to the engraving of securities have a tendency to place a monopoly of the business in the hands of the American Bank Note Company and of the Franklin Bank Note Company, which, it is asserted, is controlled by the American. The ground of complaint among these people is that they could get their work done quite as well by other companies for much less money, but they know that the Stock List Committee will not list any securities which are not engraved by the American Bank Note Company. The railroad people feel aggrieved that they are not allowed to have their work done wherever they please, and the stockholders and directors in the younger bank note companies declare that it is an outrage that they cannot compete on even terms with the American.

A *Times* reporter has visited a large number of persons interested in the engraving of securities, including officers of loan and trust companies and railways, and also brokers doing business in the Exchange itself. From

statements made by these persons the state of the case appears to be this: That the Stock List Committee will agree to receive securities engraved by the American Bank Note Company before they have been begun, but will not promise to receive the work of any other company until after examination. Whenever a railroad company chooses to take this risk and have its bonds engraved by some other company, the securities are rejected by the Stock List Committee, and the company is, in the end, obliged to go to the American Bank Note Company or the Franklin. Among the corporations which have had securities printed by other bank note companies and rejected and have had to have them done by the American are the Baltimore and Ohio Railroad, the Rome, Watertown and Ogdensburg, the Ohio and Mississippi, the Denver, Utah and Pacific, the Oswego and Syracuse, the New York, Susquehanna and Western, and the Austin and Northwestern. The State of Virginia has also been a sufferer.

The Stock List Committee claims that it has the best of reasons for its course of action. A member of it said that two great points had to be considered—the excellence of the workmanship and the security of the company. Only the best possible workmanship could be accepted by the Exchange. Secondly, a bank note company must show that it had the best possible means of protecting the plates of securites against injury or loss in any way. A small and weak company could not guarantee this, and, therefore, it was better to go to the American. The moment any of the younger companies could satisfy the committee on these points their work would receive equal consideration, and, if found worthy, would be accepted. "That is all there is in this matter," said the member.

"I consider the course of the Stock List Committee unjust," said an officer of a trust company. "I am convinced that there are bank note companies in the city which can meet all the requirements of the Stock Exchange. I know that their prices are lower than those of the American, and I know that their work is always rejected or else no action is taken on their applications. It does not look like fair treatment, does it?"

"I know," said a member of the Stock Exchange, "that the American Bank Note Company has a monopoly of the business. I have been compelled to get work done by them for $2,000 which I could have had done elsewhere for $1,400, but the Stock List Committee would only guarantee to accept work by the American. I am going to bring the matter up before the Governing Committee."

"We have suffered considerable loss of time and money," said a railroad man. "We wanted certain bonds listed, and we submitted them to the Stock List Committee. They rejected them, and we had to have them done by the American."

"Yes," answered a railroad contractor, who does a large business with the American Bank Note Company, "I know, and it is generally well-known, that the American Company has a monopoly in printing securities which are to be listed on the Stock Exchange. What has been already stated to you is correct; there are other companies which can do the work just as well, and can give just as good security, but they cannot get their work accepted, even in spite of the fact that their prices are lower."

"What I want to know," said another gentleman, "is this: Why shouldn't a railroad company be permitted to judge for itself on this question of security? It is quite as much interested in it as the Stock Exchange can be, yet the Stock List Committee compels it to go to the American. Any railroad which proposes to list bonds will not take the risk of having them rejected when they learn that the committee will not guarantee to accept any work except that of the American. I am acquainted with the work of other bank note companies and know that they can do as well as the American. I am acquainted with the responsibility of their directors, and think it should be satisfactory to the Stock Exchange."

It is asserted that American directors hold over one-half of the stock of the Franklin, and that a show of competition is kept up between them which is not genuine. It is also asserted that a sub-committee was appointed by the Stock Exchange Governors to examine the condition of the minor companies and that a report favorable to certain ones was returned, but was quietly buried without action. The business of engraving securities amounts to $3,000,000 per year, and has been practically controlled by the American company since 1858. Not more than 5 per cent. of the business is done by other companies. Minor companies, it is asserted, have been invariably swallowed up by the American.

The *Times* here attacks an acknowledged grievance among railroad and financial managers that should be frankly discussed. Any intelligent financier can add to the above list of corporations forced against their wishes, and in spite of their judgment, to accept at the hands of the American Bank Note Company models made up from ancient and obsolete vignette and lathe-work, every line of which is as familiar as the alphabet; or else subject themselves to the heavy expense and interminable delays represented to be necessary to the production of special designs. The only danger from the forging of such securities would seem to be the probability that the counterfeits would be so much better than the genuine as to deceive the very elect.

What, then, are the claims of this modest corporation, and how can they be substantiated as against those established at a later date? What are the safeguards thrown about this business inaccessible to the younger companies? "Excellence of workmanship and security," says the Stock List Committee. It is idle for the old company to claim exclusive control of artists, engravers, heads of department and skilled workmen in the various branches of this complicated business. From the nature of the case, they must themselves have trained a small army of competent persons—far more than they can furnish with steady employment. What has become of all the officers, subordinates and employés of the half-dozen or more competing companies absorbed by the old organization? It is generally understood that a large number of these have been provided with comfortable sinecures, but there are many who may not have been considered of sufficient consequence, and others who do not take kindly to such an existence. Many more, and these the best engravers, are specialists—in independent circumstances—ready to accept work to a certain extent, limited by their own desires or inclinations, from any reputable company or individual. Again, the march of improvement has not stopped at the line of the massive or the delicate and expensive machinery indispensable to the operations of a bank note company. The plant of one of the junior companies is claimed by its makers and acknowledged by experts to be beyond question the most complete, perfect and ingenious of any yet produced for the purpose. An organization so equipped, including among its directors and working force graduates and responsible managers of all the important departments in the older companies, backed by sufficient capital and a rapidly extending business is justified in guaranteeing to its patrons work equal in design and execution to that furnished by any of its competitors. Why not? As to security, one at least of the younger companies carries on the bulk of its business in its own building, provided with ample safes and vault-room absolutely fire-proof. The vaults of the different safe deposit and trust companies are at command and might prove as great a convenience under certain circumstances to them as to banks and other monetary institutions. Integrity and honorable dealing are not the exclusive attributes of any one man or set of men.

We have devoted an unusual amount of space to the discussion of this subject as one of great interest and importance to our constituents, and we predict that the day is not far distant when these junior companies will be heard, and when railroad managers, after satisfying themselves as to responsibility and facilities, will be able to

make their contracts without a fear that the arbitrary dictum of the Stock List Committee may force them to pay tribute to the most unreasonable and inexcusable monopoly of the day.

EDITORIAL NOTES.

A CORRESPONDENT writes us to inquire if we are not a little inconsistent in the use of the word "railway" as a generic term, while the word "railroad" is incorporated in the title of the JOURNAL. Railway is a comparatively new word in this country, and at the time the JOURNAL was established nearly fifty-four years ago, "railroad" was universally applied. We have been quick to recognize the superior adaptability of "railway" and have adopted it, but at the same time have naturally retained the original title of the JOURNAL. Newspapers were originally called "news-letters" and there are yet a number of publications with the title of *News-letter* which never use the word in any other connection.

* * *

ANTI-MONOPOLY indulges in some strange freaks, and is guilty of occasional inconsistency. With a view to protect their patrons and offer them every facility for cheap cab-fare, the Harlem Railroad Company recently entered into an arrangement with the New York Cab Company by which the latter were to have an office in the Forty-second street depot. But no! The grasping avaricious corporations must be suppressed, and a judicial injunction was immediately sought by an outside cabman to restrain this infamous bargain. The poor cabman is absolutely dependent upon his facilities for swindling the public and these facilities must meet with no interference from VANDERBILT and his myrmidons. Of course the public are supposed to take sides with poor cabby in his heroic struggle for extortion, and doubtless there are a few fools who would hail his success as a signal victory of honest labor as opposed to corrupt wealth. In sober truth this specimen of anti-monopoly warfare is about as sensible as any that are brought to public attention.

* * *

HONESTLY, were we capitalists in the ordinary sense, and were we subjected to the petty persecutions that all wealth must nowadays experience, we should be inclined to say to these *soi-disant* anti-monopolists: "All right, have your way. We will not attempt to interfere with the march of progress. We will spend our money in private enjoyment, and take no further interest in the building of railways, the formation of transportation and manufacturing companies, or of corporations for any purpose whatever. If you can get along without us, why do so." Perhaps we might not find much financial profit in this course but we modestly opine that the anti-monopolists would be the greater losers, and until they get a wholesome lesson of this sort it will be impossible for them to comprehend that capitalists are not such heinous creatures as they would have us believe.

* * *

THE melancholy list of wrecked banks and exposures of rascality on the part of trusted officials is increased by the ruin of the National Bank of New Jersey at New Brunswick, and a darker shadow falls upon the picture in the suicide of the two men involved in the ruin, Cashier HILL and President RUNYON. Are there any new features in the ruin of this bank? Must the public look for new causes which brought about the disaster, and are there any new and useful lessons to be drawn from the scene of desolation of homes and fortune? Alas, no! It is the same old story, and the eager, anxious crowd of stockholders and depositors clamoring for an explanation of the ruin are given the same old answer: "Wall street."

* * *

WALL street is very indignant. Wall street is also standing upon its ultra-respectability and it repels the constant allusion to its evils as most unjust and ungentlemanly. Surely Wall street is not responsible if bank officers seek to increase their wealth by dabbling in its muddy pools, and it is none of Wall street's business to inquire whose money appears in the transactions. To be sure Wall street knows perfectly well that the money is stolen money, but that can't be helped—Wall street didn't steal it. There are many professional gamblers, who from certain causes—let us hope that a spark or two of natural honor is back of them—will hesitate to fleece a victim if they know he is tampering with his employer's money; but then it would be very wicked to compare Wall street with a common gambler—Wall street! Just think of it! With its wealth, power, and the social position of its devotees. How horrible the thought!

* * *

AND yet let us think a little further. Let us suppose that a body of wealthy and influential men to the number of thousands, should organize a faro table with a capital of a billion dollars and with ordinary stakes of a million. Would not the laws of the State step in and throttle it, and would not the public rise to a man for the suppression of the unholy business, and would not these same Wall street brokers be amongst the most virtuous enemies of the wicked gamblers? Certainly they would. And yet what is Wall street but a game of faro on this same princely scale, and wherein is the difference between "chips" of ivory and those of paper? Between the gambler's currency and the "securities" of Wall street? How true to nature was quaint ROBBIE BURNS when he exclaimed:

"O wad some power the giftie gie us,
To see oursels as others see us!"

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor Atlantic and Third Avenues, Brooklyn, N.Y.

THE APPROACHING CONVENTION OF THE AMERICAN STREET-RAILWAY ASSOCIATION.

ON October 15th the American Street-Railway Association will hold its Third Annual Convention in New York City. With this fact in view a representative of the JOURNAL called upon the Secretary, Mr. RICHARDSON, for reliable information concerning the condition of the Association and the prospects for the success of the coming gathering; and the results of this interview are published in another column. We recognize this Association as a factor of the greatest interests to tramways in this country and copies of this issue of the JOURNAL are mailed to the office of every American tramway, while later information will be obtained for our October issue which will likewise be sent to tramway officials throughout the country in the hope that many of them will be persuaded to attend the Convention and by their presence contribute to its success and to the permanent benefits of the organization.

It is gratifying to observe that nearly fifty per cent. of the corporate wealth of tramways is represented in the Association by sixty-one leading companies. It is also gratifying to observe the steady increase with which the Association has been favored since its inception. But it is not gratifying to note that less than fifteen per cent. of American tramways are enrolled as members. This disproportion of membership to capital represented would seem to indicate that the small roads have largely abstained from joining the Association, and this inaction on their part might be accounted for in two ways did not facts obstinately prevent such constructions. They might abstain on the ground of expense but the fees and dues of the Association are but nominal. The admission fee is but $25 and the annual dues $15, and there is not a tramway in the country that in the face of these absurdly low sums could decline membership from motives of economy. It might likewise be claimed that the large companies would overshadow the small whose membership in that case would be purely ornamental and perfunctory, but every company casts a single vote and all are equally powerful in the Association. At the first Convention this question was carefully considered and the representation of each company was fixed at a unit in order that this objection could not be urged by the companies of small capital and equipment. With the demolition of these adverse arguments it is difficult to comprehend why so many companies are unrepresented in the Association and it is certainly to be hoped that the approaching Convention will witness a large increase of membership.

Doubtless many tramway officials are tempted to ask "*quid bono?*" or give vent to an equivalent expression when requested to join the Association, and to these we say there is every reason why they should acquire membership. The general interests of tramways are identical whether they be large or small, or operated through populous or rural districts. Track-construction, repairs, and cleaning, the care of horses and stables, the choice of motive power, the employment of labor, the care of cars, their ventilation, heating and lighting, the taxation of companies and the licensing of tram-cars are questions which every tramway is forced to consider, and it is these and kindred questions that the Street-Railway Association considers. The combined wisdom and experience of a hundred roads is placed at the disposal of every individual road, and from a wisely digested plan of operation the various committees are enabled to arrive at correct solutions of perplexing problems incident to the proper conduct of tramways. Surely the returns from the trifling expenses attendant upon membership and the small trouble involved in attending the meetings are amply sufficient.

It is surprising that tramways in this country did not form a National Association sooner than they did, but it is better late than never, and as a matter of self-interest alone every tramway official should be anxious to enroll his company among the members of the Association, nor should he stop there. The example set by the American Association has been followed by the formation of local and State Tramway Associations, and these are of direct interest to every road. Their formation should be continued and ultimately there should not be a single State in the Union in which the interests of its tramways are not guarded by a State Association. Whether they should in any way be connected with the American Association is open to question, but certainly their members should individually claim membership in both.

The AMERICAN RAILROAD JOURNAL was the first railway publication in the country to devote a portion of its space in each number to the interests of tramways, and this policy was inaugurated before the American Street-Railway Association was organized. Since the formation of this organization the JOURNAL has watched its progress with much interest, and is glad to praise it without stint. It might have degenerated into an association for a few roads, consulting selfish interests and being manipulated for the glory and profit of a few individual officials. It might have languished, and after a few slim Conventions been abandoned by its promoters. Instead, it is a live,

healthy organization, treating its members impartially, irrespective of the wealth of each, and devoted to the consideration of problems that are common to all tramways now in operation; and it is the duty of every tramway organization to sign the roll of membership.

In the United States and Canada, there are upwards of five hundred incorporated companies controlling and operating tramways. Many of these companies conduct several lines each and the total number of tramways in successful operation is doubtless nearly six hundred. That the membership of the American Street-Railway Association should at present be limited to but sixty-one of this total is not a pleasant contemplation, and so far as we are able we shall lend our energies toward increasing this membership until it has reached high-water mark, which can only be touched when the membership in the Association equals the total number of tramway companies in America.

THE BROADWAY FRANCHISE.

OF all the transparent steals for which that estimable body of rum-sellers and political "heelers," the New York Board of Aldermen, have been distinguished, the giving of the valuable franchise for the construction of a tramway on Broadway to the Broadway Surface Railroad Company is unquestionably the most astounding. The iniquitous measure was passed in the face of universal disapproval, with but one dissentient voice, and Mayor Edson promptly vetoed it. His reasons for so doing were squarely stated, stress being laid in the first place upon the necessity for keeping our main thoroughfare open to traffic, and secondly, that even should such a road be constructed, under no circumstances should so valuable a franchise be awarded for no consideration whatever on the part of the tramway corporation. Naturally it was not thought that the Aldermen would be restrained by any such calm reasoning as this, and an injunction was sought in the courts forbidding the Board to pass the measure over the Mayor's veto. Judge DONOHUE granted the injunction, but in a few days it was mysteriously withdrawn, and in the most bare-faced and shameless manner the Aldermen held a hurried and special meeting, at which the veto was overridden and the city robbed of a million dollars, since that sum could have easily been obtained had the franchise been put up for sale at public auction.

The fury of the citizens was loud and deep and an indignation meeting was held in Chickering Hall, at which Mayor EDSON presided, to protest against the outrage; and the public are so thoroughly aroused at the utter disregard of their rights, that the future construction of the road under its present franchise is extremely doubtful; but the ventilation of the steal will have one effect, and that is to call attention to the insuperable objections that present themselves to the construction of a tramway on Broadway. We argued at length upon this point in the August JOURNAL, and shall continue the argument until we are convinced that the points adduced are unsound. We are always open to conviction, but like a certain female witness we have yet to meet the argument that could convince us.

The virtuous Aldermen, it is understood, repel the suggestion that the franchise was granted without consideration, and for once their statement is implicitly believed. Whether the "consideration" came in the form of cash outright or in snug little blocks of stock in the company is as yet in doubt, but we would not be guilty of such injustice to our city fathers—step-fathers would come nearer the mark—as to suppose that they would forego their perquisites. As often stated, the JOURNAL has no sides in politics but we would heartily join in any movement to return the present Board of Aldermen of New York City by handsome majorities—return them to the slums and gin-mills whence they came, and where they are admirably fitted to shine with undimmed luster.

CABLE RAILROADS.

(Continued.)

BY W. W. HANSCOM, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

WHEN the Clay street road had been in operation about three years, its success became so marked that the owners of the Sutter street horse-car road saw in it a means of relief from the over-working of the horses over the grades of that street, so they determined to convert it into a cable road. The grades were much lighter than on Clay street, yet some of them were too steep for horses, the steepest being one in thirteen and seven-tenths.

As this road was kept in operation all the time the tube was being constructed, provision had to be made for covering the excavation so that the horses could pass over, or else a rope was used so as to allow the horses to walk along the sides for such distances as the ground was open. On this road the track which was already down was the ordinary street track on stringers, and it was determined to continue that in use, and to construct the tube so as to interfere as little as possible with the existing conditions. Castings were made somewhat similar to those first put in on Clay street, and the ties were cut so that the castings could take and support the inner ends, while the outer ends remained under the stringers which carried the rails.

The shape of the tube was flat on the bottom, with vertical sides and curved in at the top to the center, where the angle irons forming the slot were attached to each casting, the castings being placed about three feet apart as on Clay street. The sides and bottom of the tube were formed of wood, as on Clay street, and wherever plank was used on the street for paving, it was also used between

the tracks for the same purpose, but in other places the space between the tracks was paved with stone.

The principal changes made from the Clay street road in the construction of the Sutter street road, consist in the grip for taking up and carrying the cable, the plan of driving drums for moving the cable and the method of switching or changing from one track to the other at the end or any point of the route that may be desired. This is accomplished without the use or necessity of turn-tables as the dummies are not required to be turned, but run either end forward. The grip differs from the Clay street grip in the way in which the cable is taken into the jaws, and the manner of operating them by a lever instead of a screw and wedge. The cable is taken into the jaws at the side, they having a vertical instead of a horizontal movement as on Clay street, which allows the grip to be lowered vertically over the cable until it enters the open jaws, by a single vertical movement. The

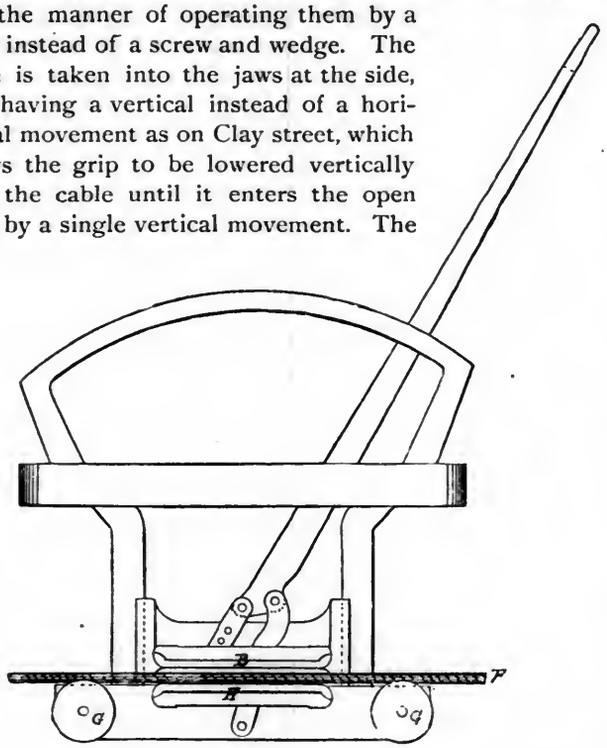


FIG. 1.

grip, as a whole, being fixed to the dummy, it has no mechanism by which it can be lowered down to pick up the cable, so that either the track and road-bed have to be depressed to carry the grip down with the dummy to the cable or the cable has to be raised at the point on the road when it may be desired to take the cable into the grip. As the lower jaw of this grip lies in the same vertical plane as the cable, either the cable or the grip have to be moved sidewise so that the cable may pass the lower jaw in coming up to enter between that and the upper.

Fig. 1 is a side view of the grip which includes the operating lever as well as the jaws. B is the upper jaw, H the lower jaw, G G the two rollers having grooved circumferences in which the cable lies and runs during the stoppage of the car, and F the cable. This grip is operated by a lever, and the necessary power is obtained through a toggle-lever or joint combined with a long arm so that by adjusting the dies of the jaw which clasp the cable, any desired pressure may be brought to bear upon it. It will be seen that only the upper jaw B is moved, the lower one H, being stationary.

The cable F, when in the grip, lies in the two friction rollers G G, whose grooved circumferences are slightly above the upper surface of the lower jaw H, so that the cable in passing through will be free from contact with it and escape abrasion. As the upper jaw is brought down by the lever upon the cable, it carries the cable down upon the lower jaw, thus clamping it between the two. Two methods are in use for "picking up" the cable or putting it into the grip preparatory to starting the car. One is by means of a hook, which, having a long handle, is put down through the slot of the tube and lifting the cable by a semi-circular movement, raises and carries it into the open jaws. This may be done when the cable is small and there is not much tension on it, and it is desired to do it while the dummy is stationary. It is often done at points where the cable may from any cause have been dropped from the grip and it is desired to replace it; but at fixed points where the cable has to be released and taken up again while the dummy is in motion, especial arrangements are made to raise the cable by a sheave, so that it may be at the level of the opening between the jaws. This sheave will naturally be in the path of the grip as it comes along, and in order for the latter to pass it, the track and slot are deflected laterally, and as soon as the grip has passed the sheave, the track is immediately deflected back again to its normal line before the cable shall have sagged, and the open jaws are carried on to the cable.

The engine-house as first constructed for this company was located some three hundred feet away from Sutter street, and the drums then used were two in number for each cable, one being connected with the engine by spur-gearing, and the other being carried in movable pillow-blocks on a sole-plate so arranged that the movable drum could be placed farther from, or nearer to the stationary one. These drums were about eight feet in diameter and had several grooves around them of sufficient size and depth to take the cable, which was nearly three inches in circumference. A number of turns or wraps of the cable was taken around these two drums until the friction on the drum connected with the engine was sufficient to drive the cable. As the cable stretched from use, the movable drum was placed farther away from the other, thus taking up the slack. The cable in passing into the engine-house from the street and out again, is guided by suitably placed sheaves. The engines which were used to drive these cables were twelve inches bore by twenty-four inches stroke, there being four, so arranged that any one of them could be disconnected from the rest by uncoupling the connecting rod, three being in use at one time. These engines had a Meyer cut-off adjusted by hand, and the regulating was done by a Gardner governor. An extension of the cable being made on Sutter street, another engine-house having two of the same size and kind of engines was constructed for driving this extension.

During the past year a new engine-house and driving machinery have been constructed, located on Sutter street, and all the cables now in use are driven by one pair of compound non-condensing engines. Additional cables are intended to be driven by these engines, the latter having ample power for all purposes required. The location of the new engine-house involved the running of one of the cables around two corners which were each right angles. The sheaves, or rather pulleys, used in carrying the cables around the curves are placed with the axes vertical, and the faces of the pulleys are in such a position laterally in reference to the slot of the tube that the grip, in

passing, will not touch them. They are placed so close to each other on the curve that the lateral deflection of the cable from one to the next is slight, and not much side strain is brought upon the grip.

The driving-drums in the new engine house are different from those used in the former house, Fig. 2 showing the arrangement. A is the drum nearest the street, B a similar drum immediately in the rear, the two being connected by spur gearing, each of the drums having but a

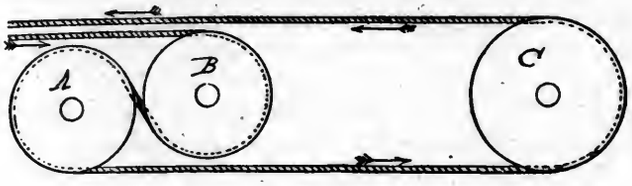


FIG. 2.

single groove. C is a sheave which is placed upon a traveling carriage so arranged that any slack that may occur may be taken up while the cable is running similar to the sheaves at the ends of the road on Clay street. The cable comes in from the street and, passing over the rear drum B, goes around and up over A, thence back and around the sheave C, and thence in a similar way to that shown in the illustration of the method of the Clay street road, except that the cable, when it comes from the street and goes on the drum B, is on about the same level as the cable in the tube in the street, and does not require the vertical sheaves as used on Clay street. These drums are the same as have been used for years on the Gordon Plane in Pennsylvania. The grooves of the drums are lined with wood to save the wear of the cable.

The engines have cyliners twenty and thirty inches in diameter by forty-eight inches stroke, making sixty revolutions per minute. They are connected with the driving-drum shaft by grooved pulleys and cotton-rope belting, the pulleys being seven and twenty-four feet in diameter, giving about eighteen revolutions per minute to the driving-drums, and a speed of about seven and seven-tenths miles per hour to the cables.

There are three sets of tubular boilers for generating steam for the engines, each set being independent, yet so arranged that either set may be connected with the engine or all at the same time. Only one set is at present required at a time, changes being made from one set to another when occasion requires.

(*To be concluded.*)

The Approaching Convention of the American Street-Railway Association.

AN INTERVIEW WITH SECRETARY RICHARDSON.

BEING anxious to keep our readers posted and to further the interests of tramways, a representative of the JOURNAL recently called upon Mr. William J. Richardson, Secretary of the American Street-Railway Association, at his office in Brooklyn, to obtain the latest information concerning the approaching Convention of the Association, which will be held in New York City on Oct. 15th. Mr. Richardson courteously placed all the information in his possession at our disposal and declared that the prospects for a most successful convention were excellent.

"In the Association," he remarked, "there are sixty-one companies enrolled as members, representing fifty per cent. of the corporate wealth invested in street-railways in the country. Our first Convention was held two years ago, at which nearly forty companies were represented. Last year the number was greatly increased and this year I confidently look for an accession of from twenty to forty new companies—new of course in the sense of membership in the Association. This membership is confined to American street-railways or their lessees or individual owners, and each membership carries with it one vote. This definition includes any kind of street-railway, regardless of the motive power employed, and I presume membership would even be permitted to an elevated railway, though none such have yet applied. Since April, I have sent out monthly to all the companies in the United States and Canada, a judicial decision bearing directly upon the interests of street-railways, and I did not confine myself to sending them to those companies alone that are members of the Association. Of course, we are anxious to publish the existence of the Association as widely as possible, and thus increase our membership, so I was very liberal with these legal decisions. They will not be distributed so freely hereafter. The Association is now an assured success, and if street-railways do not wish to join it, I do not think we ought to keep them posted with information, to obtain which we are put to considerable trouble and expense. The expense attending membership is very small, and was purposely made so in order to encourage the poorest company to join. It consists of an admission fee of $25, and yearly dues of $15, payable in advance.

"The topics to be discussed at the Convention," continued Mr. Richardson in response to an inquiry, "will be varied and of vital interest to street-railways. Among them will be the reports of the special committees appointed at the last meeting on the Completed Construction of New Road, Repairs of Track, Track-cleaning and the Removal of Snow and Ice, Stables and the Care of Horses, the Electrical and Cable Systems of Motive Power, a Uniform System of Accounts, Labor and the Graduating System of Compensation, the Ventilating, Lighting and Care of Street-cars and on Taxation and License. Thus you see we endeavor to cover a wide field of usefulness. Possibly there will be papers read on other topics, and discussions thereon, the nature of which we do not know as yet. The Convention will, probably, be held at the Fifth Avenue Hotel, and will last three days. It will be concluded with a banquet, and definite arrangements will be made for the entertainment of the members by the New York City street-railway companies having that department of the Convention in charge. From what I can gather, a number of officers and managers of street-railways will take advantage of this opportunity to visit New York, and we confidently expect a very large attendance."

"The practical results of the Association have been very beneficial," concluded Mr. Richardson, "and the successful continuance of the organization is assured. There is naturally a unanimity of interests among the street-railways of this country with regard to the practical questions which they daily meet and the difficulties with which they have to contend, and a yearly meeting of the various roads for discussing these matters have proved and will continue to prove a powerful incentive to solving the problems of street-railway construction and management. The organization of our Association has been followed by that of

local and State associations which, while independent, are working in harmony for the same ends as ourselves. There is now an Association in Ohio known as the Ohio State Tramway Association, and one in this State organized last year as the Street-Railway Association of the State of New York, which held a very successful convention in New York City on September 2d. With one exception, every street-railway company of New York City is connected with the State Association, and we look for other similar organizations as the outgrowth of the American Association. The October Convention will give the American Association a still greater impetus, and in time we trust to include among its members every street-railway company in the United States and Canada."

Second Annual Convention of the Street-Railway Association of the State of New York.

THE second annual Convention of the Street-Railway Association of the State of New York was held at the Fifth Avenue Hotel in New York City, on Tuesday, September 2d. About fifteen street-railways of this State were represented and the convention was a most successful one. Interesting reports were submitted on the subjects of Motive Power, the Removal of Snow and Ice from Tracks, and the Best Method of Collecting Fares. A lively discussion on the subject of Horse-shoeing was also held. The following officers were elected for the ensuing year: President, Charles Cleminshaw, of the Troy and Lansingburgh Railroad Co., Troy; First vice-president, William H. Hazzard, of the Brooklyn City Railroad Co., Brooklyn; Second vice-president, Patrick Barry, of the Rochester City and Brighton Railroad Co., Rochester; Secretary and Treasurer, William J. Richardson, of the Atlantic Avenue Railroad Co., Brooklyn; Executive Committee, the president, secretary and treasurer, Jacob Sharp, of the Twenty-third Street Railway Co. and the Christopher and Tenth Street Railroad Co., New York, Henry M. Watson, of the Buffalo Street-Railroad Co., Buffalo, and C. Densmore Wyman, of the Central Park, North and East River Railroad Co., New York. Of these officers, Mr. Richardson holds a similar office in the American Street-Railway Association, Mr. Hazzard is president, and Mr. Sharp a member of the executive committee of the same.

At the conclusion of the proceedings the Street-Railway Association of the State of New York, adjourned to meet in Saratoga Springs on Tuesday, September 1st, 1885.

The Electric Tramway at Coney Island.

CONEY ISLAND at present possesses an electric tramway in successful operation on the new iron pier. Though more in the nature of a model than a practical tramway it affords an interesting study for those contemplating the adoption of electricity as the motive power for tramway propulsion.

The road is operated by the Daft system, and extends for 780 feet along the west side of the West Brighton pier. The track is of two feet gauge, the rails being of the T pattern, twenty feet in length, eight pounds to the foot. These are laid on strips of wood, and all firmly bolted to the pier planking. No attempt is made at insulation, none being needed, as on the wettest days the escape of current would be scarcely perceptible. The dynamo is shunt-wound, and capable of furnishing a 6 h. p. current. It is driven by an 8 h. p. vertical engine with boiler to correspond, manufactured by the New York Safety Steam Power Company. The speed of the engine being 250, direct belting was possible.

The motor is of the same model as its predecessor, the *Ampere*, which made the successful trial test at Saratoga. Its name, *Pacinotti*, is equally appropriate. The body is built of two-inch ash, and is six and one-half feet long, by three feet wide. The superstructure is simply a dash-board twenty inches high, to which the switches for controlling the motor are attached, with a box on the rear, within which is placed the receiving dynamo.

Two cars are provided for the transportation of passengers, each twelve feet two inches long and thirty-two inches wide. weighing about 400 pounds, and accommodating twenty persons, ten on each side sitting back to back, making a normal load of forty. As many as fifty people have been carried at one time, a total weight of about four tons. The weight of the *Pacinotti* is about 1,200 pounds, and its maximum speed from eleven to fifteen miles per hour, although this is obviously limited on so short a track.

Austin Corbin and the Brooklyn Bridge.

AUSTIN CORBIN, the Long Island railway magnate, has made an offer to the cities of New York and Brooklyn to lease the right of operating the cable railway on the New York and Brooklyn Bridge. He announces himself as prepared to guarantee a yearly rental of $250,000 for a term of twenty years and will purchase the rolling-stock now in use at a fair valuation and keep the road-bed in good condition. Mr. Corbin makes a further offer to lease the right of controlling and operating the entire business of the bridge for the same term of years at an annual rental of $450,000, contracting on his part that no tolls for passengers or trains shall be in excess of those charged at present. In the event of the latter offer being accepted, the sole expense the cities would be called upon to pay would be for the police service of the bridge.

It is claimed that the bridge has not yielded sufficient revenue up to the present time to meet the expenses of maintenance, and it is thought that Mr. Corbin has seen various improvements that could be introduced in its management, rendering the bridge profitable. The two cities have as yet taken no action on his communication.

TRAMWAY NOTES.

THE Forty-second Street, Manhattanville and St. Nicholas Avenue Railroad Company of this city is still meeting with opposition in the courts, though it is laying its tracks with great celerity.

THE John Stephenson Company of this city is filling an extensive order for tram-cars for use on tramways in Japan, the first from that country, we believe.

IN order to improve and extend its road, the Broadway and Seventh avenue Railroad Company has issued $1,000,000 of bonds.

New Inventions.

The Lawrence Vacuum Brake.

LOUIS P. LAWRENCE, of Passaic, N. J., is the inventor and patentee of a vacuum brake which is herewith illustrated and described. The object of this invention is to produce a cheap, durable and reliable brake at such cost that it may be applied to railway rolling-stock of all descriptions. In the illustrations, Fig. 1 is a front view of the ejector, and Fig. 2 a vertical longitudinal section of the same. Fig. 3 is a top view of the pipe and hose-coupling, and Figs. 4 and 5 are horizontal longitudinal sections of the same uncoupled. Fig. 6 is a vertical longitudinal section of the vacuum-cylinder showing the manner in which the power is transmitted to the brake-levers from the piston C.

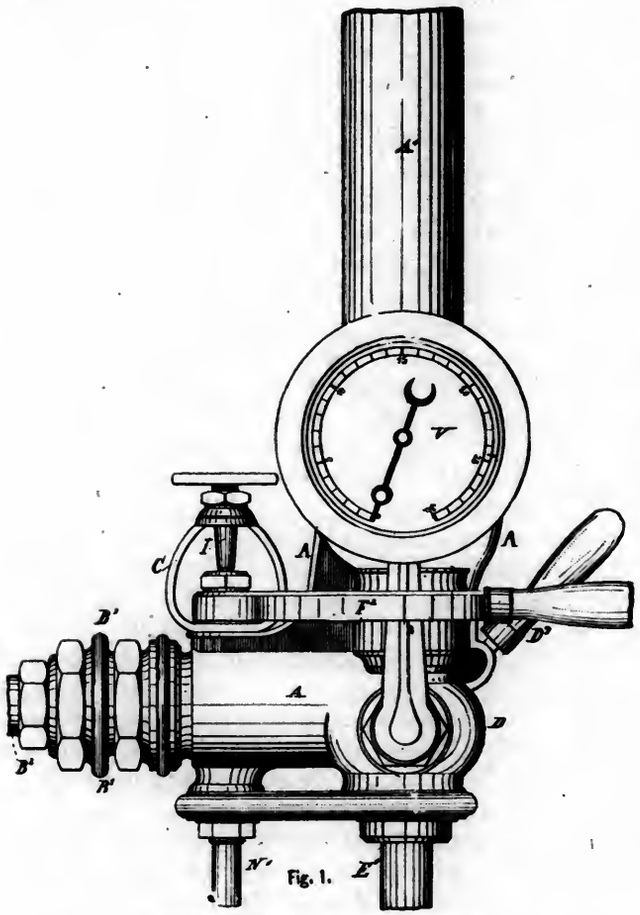


Fig. 1.

THE LAWRENCE VACUUM BRAKE.

The air-ejector (Fig. 1) of this brake has the advantage of creating a high degree of vacuum, and the water of condensation is conducted from all parts of the ejector by its gravity, to the drip-valve and discharge-pipe N at the lower part of the ejector, preventing it from entering the air-passages and exhaust pipe. The body is cast in one piece (Fig. 2) with an interior steam-induction channel, steam-expansion chamber, and air-chamber and channels for conducting the condensations.

An equilibrium-valve is arranged at the rear of the air-chamber below the air-valve, so as to reëstablish the pressure in the brake-cylinder. This equilibrium-valve is held closed by a lever, actuated by a spring. The lever is fulcrumed to the handle of the equilibrium-valve and presses upon its center in such a manner as to keep it closed tightly on its seat as will be shown hereafter. It will be seen that the brakes are applied and released by means of the levers F^2 and D^2, which are located so near each other that they are convenient to operate with one hand if so desired. In the steam supply-pipe B^2 (Fig. 2), is fitted a conical valve b' b', the chamber B′ of which is screwed or

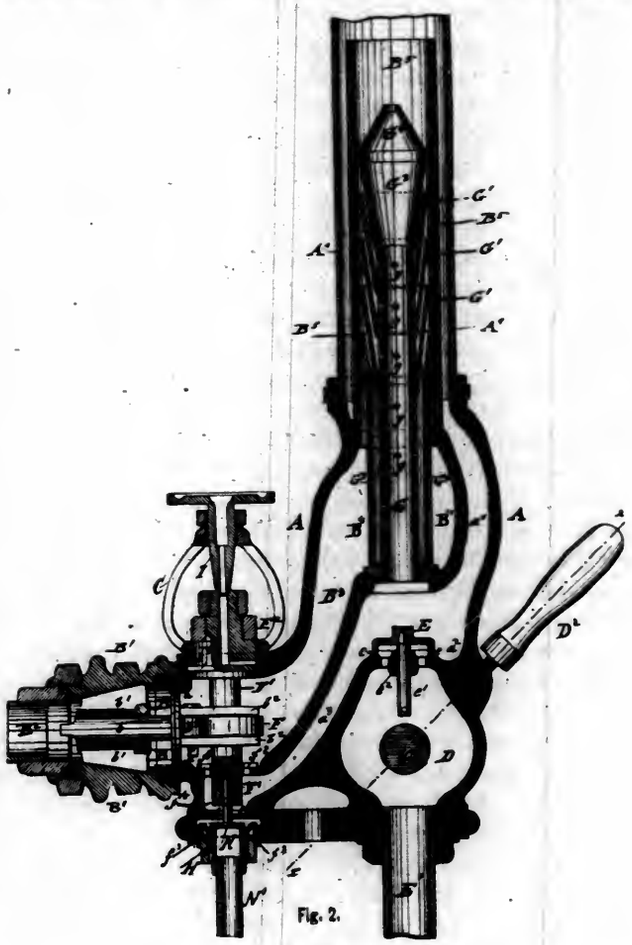


Fig. 2.

THE LAWRENCE VACUUM BRAKE.

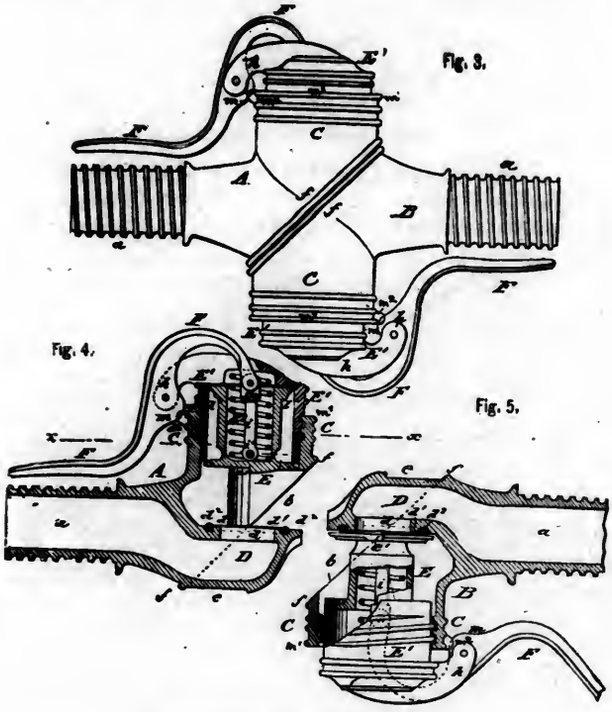
otherwise connected to the lower part of the body A, and also connected by a suitable coupling with the steam supply-pipe B^2. The stem b of the steam-valve B is guided in central bearings b' of the valve-chamber B′, while the inner end of the valve B is provided with a forked extension b^2, carrying an intermediate anti-friction roller b^3. The forked extension b^2 passes alongside of the shank F′, (Fig. 2) over an eccentric F, on the shank, which eccentric bears upon the anti-friction roller b^3, and moves the steam supply-valve B either way from the seat A into open position, or into closed position against the same, according as the shank F′ is turned by a lever, F^2 (Fig. 1), applied to its outer end in one or the other direction. The forked extension b^2 (Fig. 2) prevents the steam supply-valve B from turning on its axis in either direction, and secures the contact of the anti-friction roller b^3 with the face of the eccentric F. The steam-induction channel B^3 extends from the supply-valve B in an upwardly slanting direction to an annular steam-expansion chamber B^4, which is arranged around the air exhaust-pipe G that is screwed into an opening at the bottom of the steam expansion-chamber B^4. To the upper part of the expansion-chamber B^4 is screwed the steam-pipe B^5, and to the

upper end of the ejector-body A the exterior exhaust-pipe A′, which are both arranged concentrically to the air exhaust-pipe G. The annular space formed between the exterior exhaust-pipe A′ and the steam-pipe B^5 is connected by a channel a', extending along the outside of the expansion-chamber B^4 to an annular gutter a^2, arranged around the raised and beveled seat e of the air-valve E. The gutter a^2 is connected by a steam-channel a^3, arranged below the steam induction-pipe B_3 to a drip-valve N, which is arranged at the lowermost part of the ejector-body below the shank of the eccentric F and the seat f. The water condensation passes from the exterior exhaust-pipe A′ through the channel a' to the gutter a^2, and from the same through the channel a^3 to the drip-valve N, where it is collected and discharged through the pipe N′ below the drip-valve N. The steam induction-channel B^3, the steam expansion-chamber B_4, the channels a' and a^2 for conducting off the water of condensation, the enlarged air-chamber D, together with the valve-seats a, e, and f of the steam supply-valve B, the air-valve E, and the drip-valve N, are made in one casting, and form all integral parts of the ejector-body as shown in the vertical section (Fig. 2). This renders the ejector cheaper and more efficient than those heretofore in use on vacuum-brakes.

The steam-pipe B_2, valve-chamber B′, the valve-seat a for the steam-valve B, and the lower part of the induction channel B^3 are arranged in line with each other, so that the steam is conducted in a natural and unobstructed manner from the steam supply-pipe B^2 to the induction-channel B_3, and by the upwardly slanting portion of the latter into the expansion-chamber B^4. The shank F′ of the eccentric F is guided in bearings of the ejector-body A near the seat of the steam-valve, the upper part of the shank being enlarged so as to form a guide-cylinder F_3, which is packed by a gland to the body of the ejector. Above the gland an arch C is formed, which supports the adjustable set-screw I that presses upon the upper end of the shank F′ (Figs. 1 and 2), for the purpose of holding the lower part of the cylinder F^3 tightly on its seat of the body A. The guide-cylinder F^3 is lubricated by means of oil-passages that extend through the set-screw I and cylinder F^3 to the seat of the same on the body A (Figs. 1 and 2). The operating lever handle F^2 (Fig. 1) of the eccentric F is secured to the square exterior end of the shank F′, and retained securely thereon by a screw-nut. The handle F^2 (Fig. 1) is curved and extended across the front part of the ejector toward the right hand end of the same below the vacuum-gauge V (Fig. 1). The shank F′ of the eccentric F is provided at its lower part with a disk f', which rests on a seat at the lower end of the steam-induction channel B^3 of the body A, the seat being provided with recesses at its inner edge. The disk f' has at one point of its circumference a recess f^2, through which the water of condensation collected at the lower part of the steam induction-channel B^3 is drained off into the channel a^3, and thence to the discharge-pipe N′. The stem f^4 of the drip-valve N is guided in a central perforation of the lower end of the shank F′ of the eccentric F. The discharge-pipe N′ is secured to the body of the ejector by a gland H, which is provided with interior projections f^3, that form rests for the drip-valve N when the latter is not drawn up against the seat f at the end of the channel a^3 by the operation of the ejector. The air-valve E is made in an inverted cup shape, and is guided by a stem e' in a central bearing e^2, below its raised seat e (Fig. 2). The convex upper surface of the air-valve E sheds the water of condensation into the gutter a_2 and channel a^3. At the rear of the air-chamber D (Figs. 1 and 2) is arranged an equilibrium-valve D (Fig. 2) through which air is admitted to the different vacuum-cylinders below the cars of the train after they have been exhausted by the ejector whenever the ordinary atmospheric pressure is to be established therein. The equilibrium-valve D is provided with a lever D^2 (Figs. 1 and 2), that is fulcrumed to projecting ears d on the body of the ejector and securely retained in closed position when not in use by means of a locking-lever which is fulcrumed to the lever of the equilibrium-valve D and acted upon by a spiral spring at its rear end, so that its pointed front end is firmly pressed on the concave center portion of the equilibrium-valve D (Fig. 2). The air exhaust-pipe G is arranged with a number of suction-cones G′, the lowest cone being a part of the pipe G^2 that incloses the lower part of the air-pipe, as shown in Fig. 2. The air-pipe G communicates by openings g with annular spaces between the cones. The upper end of the air-pipe G is enlarged by an outwardly-flaring conical part G^3, and then contracted by an inwardly-flaring cone G^4, the opening of which is considerably smaller than the opening of the air exhaust-pipe G at its base. By means of the suction-cones, a more effective action of the ejector and a high degree of vacuum are obtained, while the contracted end of the air exhaust-pipe prevents the steam from entering at the exit end of the air-pipe and exerting a so-called "back action" thereon. By admitting steam to the steam-valve B, it passes through the induction-channel B^3 (Fig. 2), where it entirely encircles the air-pipe G and passes upward in the form of a tubular column through the annular space between the air-pipe G and the steam-pipe G′.

As the steam is passed into the end of the steam-pipe G at nearly its initial velocity, it lifts the air-inlet valve E and produces a vacuum in the air-pipe E′ (Figs. 1 and 2), and the vacuum cylinders connected therewith. The drip-valve N is closed, so that the atmospheric air is prevented from entering into the ejector at any point. The air is consequently exhausted steadily from all the pipes and vacuum-cylinders to the ejector, and drawn in an upward and outward direction through the exhaust-pipe until the required degree of vacuum for applying the brakes is obtained. As the steam enters the body of the ejector at a considerable distance below the lower end of the air-pipe, and is then conducted in an upwardly-curved induction-channel into the expansion-chamber, where it obtains a direction parallel to the air-pipe, it encircles the air-pipe entirely, and passes in an unbroken column through the annular space between the air-pipe and the steam-pipe, so as to exert its full effect in the most natural manner, and produce almost instantly a very high degree of evacuation in the vacuum-cylinders and a quick and effective application of the brakes. When the brakes are to be released, the steam-valve is closed by the handle of the eccentric, and the equilibrium-valve D opened by pressing the lever D^2 (Figs. 1 and 2) and the atmospheric pressure is re-established in the entire brake system. The drip-valve N is dropped in the seats of its gland, and the water of condensation falls by its own gravity and is conducted off through the discharge-pipe N′. No part of the water of

condensation can be carried along by the air when the ejector is exhausting, owing to the raised seat of the air-valve and to the shape of the channels that conduct it downward to the drip-valve at the lowermost part of the ejector. By this simple arrangement the water of condensation is drained off at each operation of the ejector so that it can neither accumulate in the interior of the ejector-body nor be carried off through the exhaust-pipe, so as to soil the adjoining parts of the locomotive.



THE LAWRENCE VACUUM BRAKE.

The pipe and hose-coupling of this brake embrace some novel features as will be seen by reference to Figs. 3, 4 and 5. Fig. 3 is a top view of the device when coupled, and Figs. 4 and 5 are horizontal sections shown uncoupled. A and B in the several figures represent the two separate parts, and it will be seen that the coupling is effected by bringing the parts shown in Figs. 4 and 5 so that the lines *f f* and *f f* are in contact as shown in Fig. 3. The shank *a* of each section is ribbed or threaded for connecting the pipe or hose thereto.

Each part is provided with a cylindrical portion or barrel C, at right angles to the shank, and with a flattened jaw-shaped portion D, between which and the barrel C an angular recess or opening *b* is formed. The shank, barrel, and jaw are made in one casting of the required size and strength. The jaw-shaped portion D communicates, by a circular opening *d*, with the shank *a* of each part, and is surrounded by a valve-seat *d'*, and by an elastic washer d^2, set into a circular groove, against which a guided spring-actuated valve-piston E is forced. The valve-piston E is guided in a cylindrical tube E' at the inside of the barrel C of each part of the coupling, this guide-tube being connected adjustably to the barrel C by means of a screw-thread. The underside of each jaw has a transverse notch or recess *e*, which interlocks with a corresponding transverse projection *e'*, at the underside of the piston E when the jaw is inserted into the space provided at the interior of the same in the interlocking part of the coupling. A diagonal rim *f* extends around the jaw and the edge of the angular opening *b* of each part, and forms a contact-stop when the parts are coupled together. The valve-piston E is guided in the cylindrical barrel C of each part by means of projections *g* of the valve portion, which enter into corresponding grooves *g'* of the barrel, for the purpose of preventing any axial motion of the piston.

The upper cylindrical part of the piston E is guided by means of an annular rim or collar in the guide-tube E', it being drawn back into the same until its projecting lower part comes in contact with the lower edge of the guide-tube and its upper part with the top of the same by means of a curved handle F, which is fulcrumed to outwardly-projecting lugs *h* of the guide-tube E', and connected at its inner end by a pivot-link *i*, to a transverse pin *i'*, at the lower part of the piston E. A strong spiral spring E^2 is interposed between the top of the guide-tube and the lower part of the valve-piston, and serves to press the latter down when the handle is released, so as to produce the interlocking of the same with the jaw of the connecting part of the coupling, and the tight closing upon its seat. The outermost end of the fulcrumed handle F of the piston is arranged in close proximity to the shank of each part A B, so that it can be easily grasped by the hand for the purpose of coupling or uncoupling the parts. By pressing the handle toward the shank the piston will be drawn back far enough into its guide-tube so that the parts may be separated. Whenever a reliable interlocking of the parts, or a tight closing of the piston to its seat is desired, the guide-tube E' of the piston is turned axially in the barrel of each part by means of its handle, by which motion interior projecting lugs *l* at the inside of the guide-tube engage the lower part of the valve-piston E and force the tighter on the recessed interlocking jaw of the other part of the coupling the more the motion of the guide-tube is continued around its axis, the screw-connection with the barrel C securing the forward motion of the piston. The handle F bears during this motion, by an inwardly-projecting lug *m*, near its fulcrum, on a rim *m'*, of the cylindrical barrel C of each part, so as to prevent the rattling of the handle. When the handle is brought back again to its former position in line with the shank, the projection *m* is in contact with a projecting lug m^2. When, however, the valve-piston E is to be locked to its seat, the lugs *l* of the guide-tube E' pass up through notches l^2 of an annular rim *l'*, at the upper end of the tubular part of the valve-piston and press, on turning the handle and guide-tube, down upon the collar, so as to force the lower part of the piston tightly down on its seat. When the handle is returned against the notch m^2 the interior lugs *l* are in line with the notches l^2 of the collar, and then admit the forward motion of the piston by the spring or the drawing back of the same by the handle. By taking hold of both parts and handles and drawing back both pistons, the jaws can be inserted into the interior spaces of each part, so that a reliable coupling of the parts is obtained on releasing the handles. By giving to the guide-tubes of the pistons, by means of the handles, an axial turn, the pistons are rigidly and reliably locked to the jaws, and thereby prevent any possibility of detaching the parts. By returning the handles into line with the shanks and lifting the piston sufficiently so that the interlocking shoulders at the under sides of their jaws clear each other, the parts of the coupling can be un-

coupled quickly and with great facility. By the rapidity with which the coupling and uncoupling can be accomplished, as well as by the reliable and intimate interlocking of the parts, the coupling is specially adapted for the air and steam-pipes of railway cars, for fire-hose, and for applications of a similar nature.

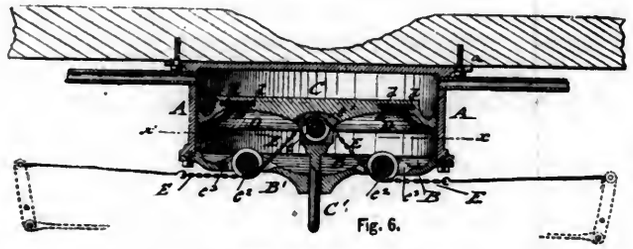


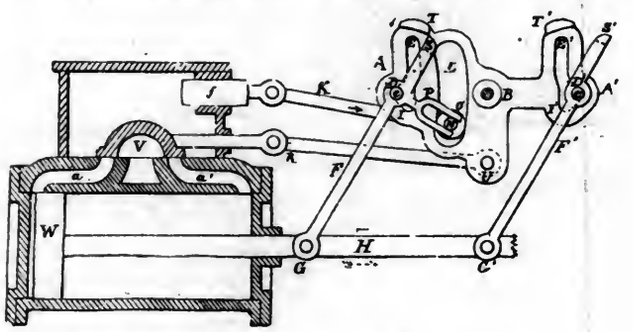
Fig. 6.

THE LAWRENCE VACUUM BRAKE.

Fig. 6 represents the vacuum-cylinder of the Lawrence brake. The head of the cylinder is attached to the bottom of the car-frame by bolts *a a*. The head and side walls are cast integral. The vacuum-cylinder A A is closed at its lower end by a bottom B, that is rigidly secured to the cylinder A. A piston C, is tightly fitted by a ring-shaped rubber packing D, to the interior of the cylinder, the packing D being attached by flanges *d d* into a circular recess *d'*, at the under side of the piston C. The outer circumference of the piston C is made of downwardly-flaring shape, against which bears the packing-ring D. The packing-ring D is sprung by its flanges *d d* into the recess *d'* of the piston, and is detained rigidly thereby without riveting or any other means of attachment. It may, therefore, be readily replaced at any time when worn out by use. The vacuum-cylinder A is connected to the air-ejector of the locomotive by connecting-pipes and intermediate pipe-couplings in the usual manner. When a vacuum is established in the cylinder A, the piston C is lifted by the pressure of the atmosphere. The packing-ring D is thus sucked tightly around the edge of the piston and against the side wall of the cylinder, so that the admission of atmospheric air is entirely prevented, and a high degree of vacuum is established in the cylinder. As soon as the vacuum is discontinued and atmospheric pressure established at both sides of the piston, the same glides downward easily without interference by the packing D. The piston C is provided with a central downwardly-extending stem C', which is guided in a central perforation of the bottom B. A diametrical recess *e'* is arranged in a central hub of the piston C, the recess being of sufficient width to admit a guide-roller *e*. Equidistant from the stem C' the cylinder-bottom B is provided with guide-rollers e^2, which are arranged in slots of a diametrical reinforcement of the bottom, and in line with the recess *e'* of the piston-hub. The chain E, which connects the brake-levers of the car-trucks, is passed from one brake-lever over one guide-roller *e*, of the piston, then over the second e^2, and the opposite brake-lever, as shown at E E. On establishing the vacuum in the cylinder A, the brake-levers are actuated and the brake-shoes applied to the car-wheels. As soon as the vacuum is discontinued the piston is lowered by its own gravity and that of other parts connected therewith, and the brakes are released without the use of springs. In this manner a very effective vacuum-cylinder for railway car-brakes is obtained, which is simple in construction, and quick and effective in operation.

Windhurst's Valve-gear for Steam-pumps.

THE cut below illustrates a valve-gear for steam-pumps invented and patented by Lewis Windhurst, of Springfield, Ohio. P is a forked branch of a link F, serving to move up or down the roller O, on the pin N, in the wide slide or arc L. This roller and pin form the end of a pushing rod K, which is here shown as pushed by a steam-plunger making pressure at the point N, always tending to turn the main lever A A' in a certain direction depending on the situation of the point N either below the center B, or above it. This steam-plunger is best for large engines, but in small engines it can be replaced by a spring. The roller O, being moved by the fork P of the link F, always accompanies every motion at the piston-rod, standing highest when the piston is at the outstroke and lowest at the extreme instroke. It will be seen that the main lever A A', and therefore the slide-valve, is moved by two forces: by the piston-rod and links as far as the dead-point of the valve covering both ports, and after that an extra amount, sufficient to open one port, by the force applied by the rod K, this force being set free to act just at that time.



WINDHURST'S VALVE-GEAR FOR STEAM-PUMPS.

In the illustration the piston-rod and all parts connected therewith are almost at the extreme instroke and the rocking-lever A A' is in a position corresponding to the dead-point of the valve. The acting points or pins *e e* of the links F F' resting in the corners D D' of the slits E D and E' D', and the upper part S, of the link F is just ready to escape from under T, these parts acting as a time-lock, setting free the power of the roller O, exerted on the rocking-lever A A', and readily corrected by setting T in its proper place to take up wear. The slightest inward motion of the piston-rod indicated by the upper arrow at H will disengage the end S from under T, upon which the rod K is free to act, forcing down the arm A a little more than shown, and opening the port *a*. At the same time the arm A' would rise a little, moving the corner I' against the pin *e'* of link F', etc.

It is claimed by the inventor that this valve-motion will do away with auxiliary steam piston-valves, moving the slide-valve similar to an eccentric, causing a gradual opening and closing of the ports with a minimum friction; that it avoids the wear of small surfaces exposed to great pressure and admits of their adjustment, and that it has no dead-points whatever. The device is inexpensive, requires no close fitting and admits of easy alteration and regulation, as all ports are outside in plain view.

IT is stated that a Canadian invention for lighting cars by electricity, the power being taken from the car axles, has been tried successfully upon the Grand Trunk Railway.

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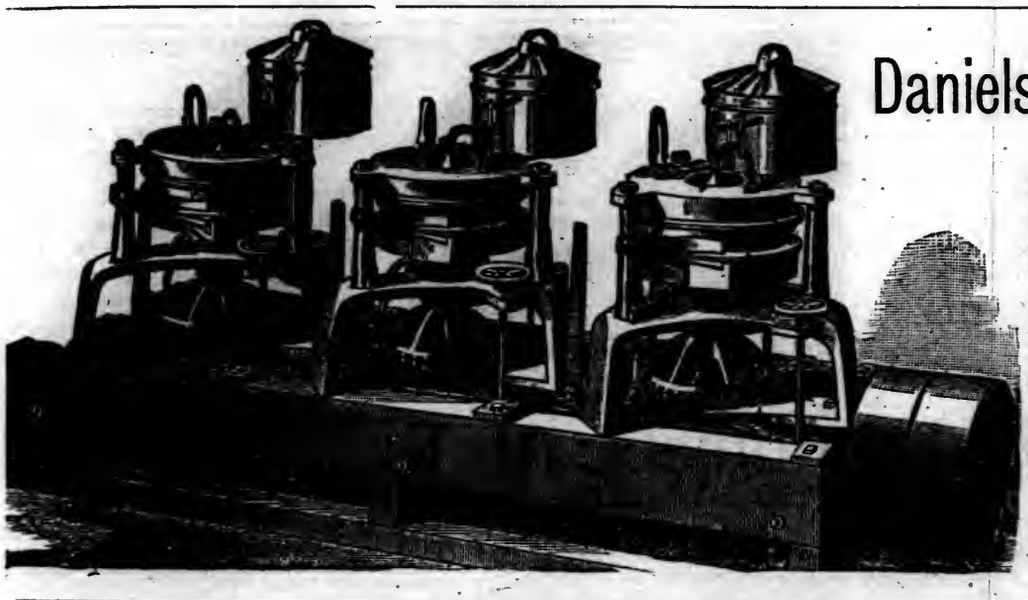
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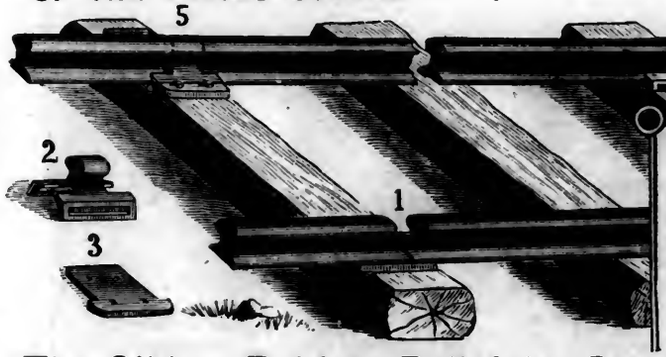
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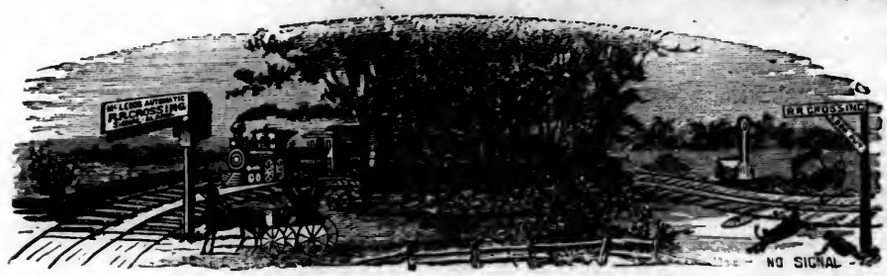
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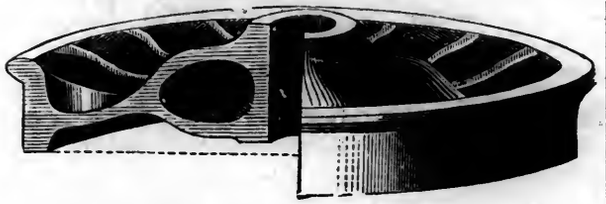
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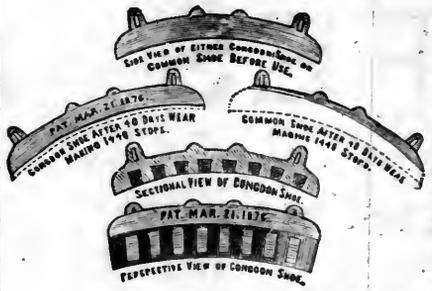
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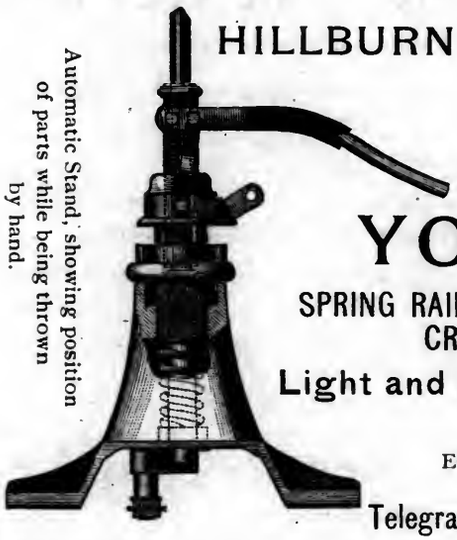
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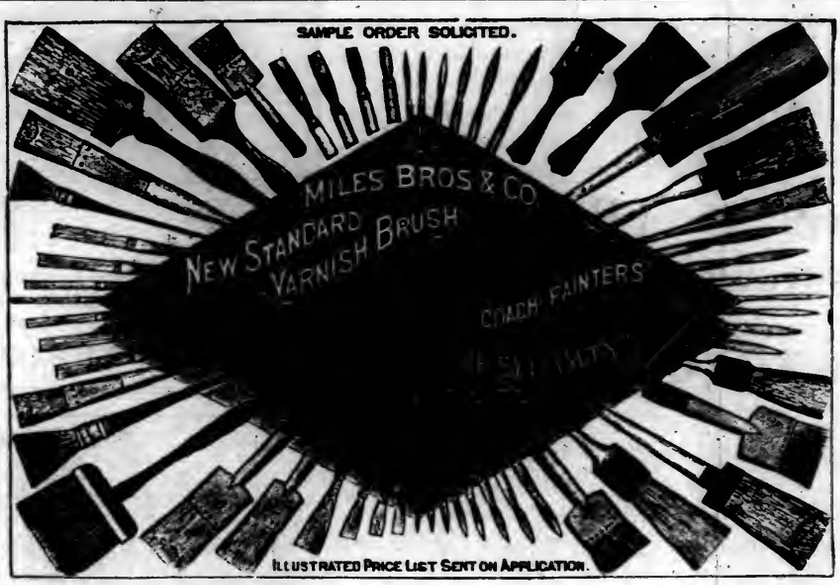
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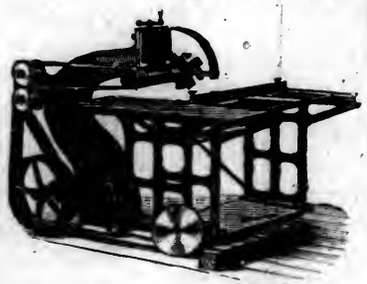
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American Railroad Journal.

WHOLE NO. 2,557.] NEW YORK, OCTOBER, 1884. [VOLUME LVIII.—NO. 7.

RAILWAY TERMINOLOGY.

BY LAWRENCE T. GOFF.

[Written for the AMERICAN RAILROAD JOURNAL.]

A BRIEF editorial note in the September JOURNAL explains, and I think satisfactorily, why the word "railway" is employed as a generic appellation by this publication, despite the fact that the word "railroad" is incorporated in its title. The reason adduced—that the word "railway" possesses superior adaptability—is sound, and one is naturally prompted to run over the gamut of railway terms for the purpose of instituting further comparisons as to the superiority of synonymous technical words and phrases. Railway terminology, or to use less erudite and alarming language, the science of the exact use of railway technical terms, is a branch of study sadly neglected, and as a consequence there is little uniformity in their use by the English-speaking nations. What in this country is a railroad is in Great Britain a railway; a street-railway is there called a tramway, a locomotive an engine, a locomotive engineer a driver, a fireman a stoker, a railway car a railway carriage, a railway conductor a guard, and a railway depot a station. There are a number of minor railway terms that are employed in the two countries showing equally wide differences, but those I have enumerated are the most conspicuous, and may with propriety be taken as the text of my brief discourse.

It would seem that the proper use of railway terms and, in fact, of all technical terms appertaining to any science, business or industry, should depend upon their exactness of definition and signification. A word should be obtained for everything that should mean that one thing and no other, and it is in order for us to examine the various railway terms of the two countries with a view to ascertaining which possess this desired exactness. As a minor investigation it would also be well to ascertain which have the greater adaptability, thus deciding the merits between terms in other respects equal.

Let us begin with the general terms of "railroad" and "railway." Here it will be seen that the two words possess exactness of definition and signification to an equal degree. Either word at once defines itself, and there can be no question as to their meaning no matter what the connection in which they are used. A railway is a railroad and a railroad is a railway. So far they are equally expressive, and the question between them is to be settled upon their adaptability. Making due allowance for differences of opinion I should unhesitatingly pronounce judgment in favor of railway. It is more easy of enunciation, is not open to question, as is railroad, whether it should be one or two words, or a compound or simple word, and its use is fast superseding that of the American term. In the first days of railroads in this country the word was written "rail road;" subsequently it became "rail-road," and it is but recently that the word was entirely blended into "railroad." Even now it is universal to use the expression "R. R." for the purposes of abbreviation. Railway, on the contrary, has always been railway, and its abbreviation is "Ry," which is certainly easier to express. Upon the ground of adaptability, therefore, it strikes me that railway should receive the authority of those who are aiming at a uniformity of terms. At the same time the simple word "road" is a very convenient term to apply in a general sense, and its use is not inconsistent with that of railway.

Contrasting the two terms "locomotive" and "engine," it is immediately seen that the former possesses by far the greater exactness of definition and signification. The word locomotive is strictly confined to the mechanical engine employed in railway traction, while engine means nothing beyond a motive mechanism. It may be a steam engine, or a caloric engine, an hydraulic or a pneumatic engine, a stationary engine or a traction engine, and thus *ad infinitum*, while it is at the same time frequently employed in a figurative sense. There is nothing about the word that is distinctly applicable to railways and to railways alone, while the reverse is the case with regard to locomotive. Therefore I do not think it will be questioned that by the standard of exactness the term locomotive should be given the preference over the term engine.

With some inconsistency Americans have rejected the use of the word engine and supplanted it with a superior term, while at the same time they have employed the word "engineer" in a sense in which their British brethren have never used it. Certainly on grounds of both exactness and adaptability "driver" is a better term than engineer to describe the mechanic in charge of the locomotive on the road. An engineer should be either a civil or mechanical engineer. It is, or rather should be, a strictly scientific term, and the peculiar province of engineers should not be confounded with that of the mechanic who is merely in charge of the completed mechanism. Driver is perhaps not very exact in signification, but it is so to an extent that signifies the control of motive power whether the latter be a horse or a locomotive, and unless some superior term should be introduced it should have precedence over the absurd and inappropriate term of engineer as applied to the mechanic in charge of the motive power of railway trains. For similar reasons the term "stoker" is superior to its American correlative, "fireman." A fireman generally conveys the impression of a member of a municipal fire department, and thus there is little exactness of definition, while stoker is a good old English word derived from *stoke*, a stick, signifying one who rakes or sticks a fire and thus tends it. It is employed in no other sense and is also superior to the term fireman in its adaptability.

The two terms, "car" and "carriage" next claim our attention, and I think in this comparison the Americans have the best of it. The words are from the same derivative, and in exact signification are pretty much the same thing, but car has become practically obsolete in any other connection than that of a vehicle for the transportation of railway passengers or freight, while carriage applies to all vehicles of transportation. Certainly car is a shorter and more convenient word than carriage, and thus it is superior in adaptability as well. In this connection I am reminded that the word "coach" is creeping into use on American railways as a designation of parlor, sleeping and hotel-cars, and while it is open to the same objections as carriage, it may serve a useful purpose as a class distinction among railway cars.

"Conductor" and "guard," the terms used in America and Great Britain to signify the person in charge of a railway train or car, are both open to objection on the ground of vagueness of definition, the latter term especially. It is not the duty of a railway guard to *guard* a train so much as it is to superintend it and control its movement within certain limits. Guard is a word in universal use and contains no special signification beyond that of one who exercises watchful care. Conductor is a little better, and the word more adequately expresses the appertaining duties, but that, too, is a word in general use, and is not confined to railways alone. Clearly there is room for a new word in this connection but until it is established, conductor would seem to be preferable to guard.

Of all absurd misnomers among railway terms the word "depot" stands preëminent. I believe the aspiring genius who first applied the word depot to a railway station has hidden himself from public view, and he is to be commended for his prudence, for if ever a man deserved the wrath of verbalists he is the individual. A depot is as far removed in signification from a railway station as it is from a whale. A depot is simply a magazine or storehouse, and how it ever came to be misapplied to a railway station is an impenetrable mystery. Station is the proper word, and I rejoice with the "Old Traveler" in the June JOURNAL to mark its gradual adoption in this country.

I have reserved the comparison of the terms "street-railway" and "tramway" for the last, since they are not strictly railway terms, if we confine railway to the steam-railway. Certainly from every point of view I should think tramway the better term. It is exact in definition, superior in adaptability, and open to but one construction. That street-railway is none of these can be seen from the fact that it is variously called "surface-road," "horse-road," and "street-road," none of which are necessarily correct, since a tramway need not run upon the surface of a street, nor through a street, even, and is not of necessity operated by horse-power. I am in full sympathy with the JOURNAL in its efforts to nationalize the word tramway, but I must confess I think it has undertaken a good-sized job.

To summarize, I should say that the American railway terms of locomotive, car and conductor are superior on the grounds of exact definition and signification to their British correlatives, engine, carriage, and guard, but that the British terms of railway, tramway, driver, stoker, and station are much more satisfactory from every point of view than the Americanisms of railroad, street-railway or the like, engineer, stoker, and station. In the general superiority of terms Great Britain has the advantage, and I am glad to note that this superiority is being recognized in this country by a gradual adoption of leading British railway terms. It cannot be said with equal truth that our British cousins are as readily disposed to concede our supremacy in the advantageousness of the few terms which we manifestly can claim as represented. But then we must be charitable, and remember that the idea of a change is viewed with horror by all true Britons from their birth.

Doubtless the time will come when there will be a uniformity of technical terms among all English-speaking peoples, but it will be the work of many years to bring it about. I have entered into the discussion of the subject, not with any fallacious ideas that there was any immediate hope of a symmetrical railway terminology, but simply, in as brief and unobtrusive a manner as possible, to point out the seeming defects and advantages obtaining on this side of the water. It is always interesting to enter into comparisons, when they can fairly be made, and such a case is the present.

THE INTERESTING "WEST SHORE."

BY CHARLES H. E. REDDING.

[Written for the AMERICAN RAILROAD JOURNAL.]

DURING the summer of '83, I was as curious as most travelers to try the new "West Shore" route. Accordingly I went to Albany. I returned dusty and happy. At that time I was inclined to cavil at the dust. I could not understand why some of the rock that was strewn about superfluously, was not scattered along the road-bed where it would do most good—to the passenger. Notwithstanding a few inconveniences of this nature, it was plain to be seen that the equipment was really excellent, and it was equally apparent to the feelings that solid comfort could be extracted from riding over a 42-inch steel-tired paper wheel on a heavy steel rail. In January the road was opened to Buffalo, and having allowed a sufficient time to elapse for affairs to get into smooth working grooves, I concluded I would again try it, and see the thing through, and I am free to say the trip was pleasant; very, very pleasant.

I concluded that August would be a good time to start, because, in that month, the summer tourist is abroad, and the almanac contains no giddy and contradictory reports about the weather. It is nearly certain to be continuously hot; and if a road can adapt its management to hauling large numbers of passengers who are cross and hot, in a way that cultivates the smile of confidence and comfort, it may be said to have learned the important alphabet of its business.

I knew that the West Shore had two termini in New York, but as I could not, with perfect convenience, use both at once, I compromised by dispatching my luggage over the Desbrosses street ferry, and boarded the convenient new Forty-second street tramway that lands one at the foot of West Forty-second street, facing the ferry station. It is a nice station; I liked it. I shall like it better when the Board of Health puts to a horrible death the man who empties the waste products of the near-by gas companies into the North River, thus rendering life temporarily unsupport-

able to the traveler. The boats of the company are as new, clean and comfortable as they should be, with roomy, light and airy cabins, tastefully decorated in a sober taste that pleases without wearying. At night, incandescent electric lamps supply a bountiful light.

Weehawken is not a picturesque spot, nor has it considered it at all incumbent on its stolid Dutch dignity to advance too rapidly in the wake of progress, but the railway terminus is one of the best on the Jersey side, and will be better when the passenger sheds replace the temporary expedients that the sun and rain now make merry over. When I had reached this point on my journey it was 8.20 P. M., and a section of the train composed of sleepers was in waiting. A short ride takes one through the Weehawken tunnel at the end of which the remainder of the train that took its departure from the Jersey City station is found waiting, and after a little preliminary backing and bumping, we are off at a very respectable speed in a straight line for the long tunnel that opens on the Hudson River just below Haverstraw.



A FLYING SKETCH OF THE APPROACH TO THE HAVERSTRAW TUNNEL ON THE "WEST SHORE" ROAD.

After leaving the pretty Haverstraw station it may be said that one is fairly under way, and time is had to look about and consider one's surroundings. In the present instance the surroundings were especially comfortable. Pullman Buffet Sleeping Cars are among the attractive features of the West Shore, and to make a note of the interior fittings of such a car is to catalogue the latest refinements and excellences of car-construction. One is sensible of an easy, gliding motion that has a potent effect upon the eyelids, and while you have resolved not to retire, but, on the contrary, to enjoy your cigar and the beautiful moonlit Hudson, you presently find that the porter has made your bed none too soon for your comfort. Free from draughts, and yet enjoying a perfect ventilation, you sleep the sleep of the weary, and awake refreshed, and as far as Syracuse on your journey. Meantime the Hudson River division of the road has been traversed, and those bound to Albany and further North, long ago bade you good night at Coeyman's Junction.

Stepping out on the Syracuse platform you see one of the handsomest railway stations in the State, and you also have an opportunity to consume thirty minutes in eating an excellent breakfast. As it is quite early you may prefer breakfasting later, in which case the buffet in the sleeping-car places its resources for a light meal at your disposal.

From Syracuse the journey to Buffalo is continued on a single track, through the always attractive and mildly picturesque valley of the Mohawk. At Genesee Junction, the wayfarer who prefers Rochester to Buffalo, steps into another car, and is rattled over the intervening four miles in very short order. Just outside of Buffalo the through Western passengers are shunted off upon the Suspension Bridge track, and pursue their way to Niagara Falls, there to make connections with the Grand Trunk and the West. Those who continue to Buffalo are landed very near to the Erie and Central stations, and may, without inconvenience, be transferred to the Michigan Central or Lake Shore trains. In this instance the "close connections" of the time cards, so often a hollow mockery, are a pleasant fact.

The trip seems as brief as it has been pleasant, and after fully enjoying it one begins to wonder why, and to seek for causes. To begin, the West Shore officials are polite and attentive. That is a large item in the comfort account. The passenger equipment of the road is certainly admirable. The ordinary passenger-cars have low, easy seats, large, high windows, and the artificial light is supplied by the Pintsch system, an excellent substitute for gas. The cars are hung on broad-based trucks with 42-inch paper wheels. The rail-joints alternate instead of being placed opposite each other, hence one escapes the *clickety-clack* sound and motion so disagreeably familiar, and in place of it experiences an easy, steady motion that seems more as if one was riding over an unbroken, continuous rail.

There is a seamy side however. The locomotives burn soft coal. True, other roads do likewise, but this road started out on the anthracite basis, and it is a pity it was not adhered to. Again, there seems to be a war of car-couplers. The Janey is displacing the Miller, or, perhaps it is the other way—at any rate, the transition state leads to a large amount of tinkering and delay.

But there is one feature in the Pullman car service that should decidedly be "put into circumspection and restraint." It is the porter. This voracious bird of prey is an annoyance to men, and a terror to women. In the buffet-cars there are two of the species, one of whom has half his time employed in brewing cups of tea, and making the edible sandwich, while the other half is devoted to a stealthy watch over the male chambermaid, lest he gather in more quarters than should fall to his share. Until it becomes annoying, it is amusing to observe the tactics of this precious pair, and their eager pounce upon the prey. Sometimes a victim is commanded to stand up and be dusted for the second time. If he is not too fresh and tender in the ways of the porter he will demur, and then comes an emphatic argument from one of the duo, accompanied by knowing leers, as who should say, "you may be extremely clever as a purveyor of dry goods on your native heath, but you can't get away from a Pullman porter by any such simple subterfuge as the explanation that you have already been brushed by the other Dromio." I had the satisfaction of seeing one passenger demand change for fifty cents a few minutes after he had been brushed. It was not made by the porter, because, as he averred, he had no change at the moment. Later the sufferer again made a demand on the buccaneer for his

money, but the innocent black pirate had never received any fifty cents, and turned with a truly injured expression to suggest that it must have been his Corsican brother. After considerable squabbling he disgorged. This, I suggest, is not pleasant, and is worthy the attention of the Pullmans, unless they take pride in the Dick Turpins in their service and view their antics as justifiable enterprise, enabling the company to save considerable in salaries.

The lasting impression of a trip over the New York, West Shore and Buffalo Railway, is, however, very agreeable, and it is no matter of surprise that the patronage both local and through is showing a steady, healthy growth.

THE COMFORTS OF TRAVEL..

BY ONE OF THE TRAVELING PUBLIC.

[Written for the AMERICAN RAILROAD JOURNAL.]

"CHEMIN DE FER" discourses upon the subject of Railway Art in the September JOURNAL, and so far as a poor ignorant layman can determine, he discourses very well, but I venture to assert that the vast bulk of travelers while, of course, pleased at the artistic excellence of railway stations and cars, are far more interested in the absorbing question of railway comfort. I know that is the way it strikes me, and while not aspiring to any technical railway knowledge I have traveled enough to know that comfort in travel is the chief end for which we patrons of the railways strive. We do not always get it, and a number of roads seem to regard the comfort of their passengers as a matter entirely secondary to the speed of their trains and the elegance of their appointments, but those roads among competing lines that look most carefully after the comfort of their passengers are, in the end, the roads that win the good-will of the traveling public.

It is not alone bodily comfort that we travelers seek, but mental comfort as well. We do not wish to be harrassed with fears of detention; with uncertainty regarding connections; to be pestered by officious railway hands nor rebuffed by discourteous officials. We do not wish to be worried with regard to our tickets, nor to feel that they must be used within a certain date or become void. In fact there are a score of ways that our lives may be rendered either miserable or blissful while on the rail, depending upon the mental comfort that we obtain.

As far as bodily comfort is concerned there is of course even more to be said. Nothing so upsets a man—or a woman either for that matter—as a railway journey passed amid uncomfortable surroundings. A stiff-backed seat, too large for one person and too small for two, is a great agent to render our hours of travel miserable, and I know to my cost that there are many apparently luxurious seats in palatial railway cars that are delusive in their appearance. It strikes me that the system employed by many, and in fact, by nearly all roads, of placing seats in cars, is open to objection. This system begins by adjusting the seats to the contour of the passenger's back, and that is all right as far as it goes; but at the end of the route the backs are turned over and they are expected to conform as well to the human frame in the new position as in the old. Upon the same principle a tailor might as well make a pair of trousers that could be worn with equal comfort hind-side forward.

Another so-called convenience of railway cars—inconvenience more nearly approaches the truth—are the car-windows and sashes. They are ordinarily contrived with such diabolical ingenuity that when once raised they cannot be lowered, and when lowered they resist all muscular attempts to raise them. Furthermore they are contrived to "go the whole hog" so to speak, and the passenger must either have them opened all the way or leave them hermetically closed. Recently while traveling over the Philadelphia and Reading road I observed a commendable improvement in the matter of regulating the amount of light admitted through the car-windows. The cumbrous sashes were dispensed with and in their place were tasteful window-curtains that could be raised and lowered to suit the exigencies of the case. These curtains, I should surmise, cost less than the sashes and are certainly far more convenient.

Maybe there have been railway cars that have been properly heated and ventilated, but I don't remember ever having ridden in one. They are either hot and close, or cold and draughty, but possibly the travelers are themselves to blame for this state of affairs; for of the fifty-odd passengers in the ordinary passenger-car each individual has different views with regard to the proper degree of heat and air required to insure health and comfort. It strikes me as a good plan for the railway companies to instruct their conductors in the principles of hygiene, and thus, being in a great measure men of science, they can determine the precise thermal and atmospheric conditions conducive to health.

O! thou plague of the railway traveler—the railway restaurant! How many attacks of indigestion can be laid at thy door! Of all unspeakable discomforts with which the long-distance traveler is subjected, the railway restaurant stands grandly at the head. Ill-cooked food and weak tea and coffee might be put up with, but when it comes to performing the acts of mastication and deglutition appertaining to a whole meal in the space of five minutes, two of which are consumed in allowing the viands to cool, patience ceases to be a virtue. Delmonico would blush to charge the prices which prevail at the ordinary railway restaurant, but I am certain he would die rather than furnish such food. It does not strike me that it would be difficult for the railways to introduce improvements in this question of railway restauration. Surely the allowance of a few extra minutes in which to devour the meal and the exercise of a watchful care over the methods of the restaurant would be followed by wonderful results, and the poor traveler would no longer be compelled to include the cost of a physician's prescription among the items of travel.

But why go on? The number of discomforts to which the traveling public is subjected is a goodly one, but in justice I must say that the railways are doing very well in their efforts to reduce them to a minimum, and the only trouble is that they are taking too much time to accomplish this much-needed reduction. They aim more for luxury than comfort and while the former is most pleasing, the latter is, or ought to be, the chief consideration.

Under the head of mental discomforts I could say much, but I do not wish to be reckoned a grumbler, and I will confine myself to one all-important item. I will premise my remarks under this head by dividing the *genus* traveler into two species: the long-distance traveler and the short-

distance traveler. To the former the bodily discomforts which I have mentioned come with the greater force, since their evil effects are commensurate with the period of endurance; but the latter—the poor unoffending traveler who daily, and twice daily perhaps, is compelled to journey between two contiguous points—is the one who catches the mental discomforts with all their force. Chiefly does he experience it where he patronizes local trains on through routes, where local travel is entirely subordinate to through travel. If a through train is behind time all local trains must give it right of way regardless of their schedule time. The passengers upon the local trains are all, or in great part, bound upon a business errand, or performing a daily journey to and from their places of business, while the travelers upon the through train, coming from remote points have, without doubt, made full allowance in their calculations for unforeseen detentions; but this makes no difference. There is generally competition in through travel and monopoly in local travel, and therefore the railway must perforce give precedence to the former. In the absence of any definite information as to the precise relative profits between through and local travel I cannot speak as one having authority, but I will venture to assert that there is not much difference either way as a general rule, and I therefore enter a solemn and, doubtless, ineffectual protest at this unwarranted discrimination. Why should the poor local traveler, a faithful and constant patron of the road, be kept upon the anxious seat, knowing that Jones is waiting for him at his office on important business, or that Smith is to meet him in half an hour to pay a long-standing bill, while the through traveler with plenty of time upon his hands and no immediate engagement to meet is whisked by him in the most aggravating manner? Surely this is most unjust, and yet the railways are much in the position of the late-lamented Mr. Tweed, and can calmly inquire, "What are you going to do about it?" They know that we are compelled to patronize their roads and thus they smile defiance at our puny wailings.

But I have grumbled enough, and when I consider the constant improvements that are taking place in railway traveling facilities, the increase of train accommodation, and the marked beneficial changes that are being introduced in our railway methods, I am in a great measure silenced. Upon my word I am almost forced to conclude that I couldn't run things any better myself, and this is a great confession for a traveler to make. I only wish to say in conclusion that we—the traveling public—are not inappreciative of the benefits which the railways have conferred upon us, nor of their efforts for improvement in the details of traveling; but if our views are to be consulted let us have comfort above all things. Speed is a good thing in a railway train, and doubtless there is a wish on our part for more of it; handsome railway stations and æsthetic passenger-cars are pleasing to the eye and to the soul; but these are luxuries, and while we enjoy them, we yearn for a little more attention on the part of the railways to the increase of railway comfort, and the way to find out what is comfortable is to discover what is uncomfortable. These discomforts are palpable, and by their mitigation we are put in possession of the most inestimable pleasure in life, that of comfort, and I don't think there is any kind of comfort more solidly appreciated than the comfort of travel. At least not by the fraternity of travelers in whose behalf I plead.

RAILWAY DINING-CARS.

THE extent to which these cars are already in use at the West, and their gradual introduction of late upon several Eastern roads, is beginning to raise the question whether this innovation upon former usage is likely to supersede to any considerable extent the ordinary station restaurants. A good deal of argument more or less weighty has been advanced on both sides, but the preponderance one way or the other can hardly be so decided as to arrest the increasing popularity of dining-cars, or do away with the prevailing practice of eating at stations.

According to the current issue of Poor's Manual, 312,000,000 passengers were carried on the railways of this country in 1883, which was an increase of 23,000,000 over the number carried in 1882. A very large proportion of this aggregate, of course, made short trips or carried their dinners with them, but the number who did their eating at station lunch-counters and tables must have run away up into the millions, all of which indicates pretty clearly that the business of feeding railway travelers is as yet comparatively "in its infancy," as the phrase goes. These millions are made up of all sorts of people, the most of whom can discriminate between good and poor fare, and it may be assumed that the most of them are also willing to pay seventy-five cents for a square meal if it is passably good, or a little better than they are accustomed to get at home. There is also a pretty large and increasing number who are willing to pay a dollar, and even more, for a so-called first-class hotel breakfast, dinner or supper, served in a dining-car. Now, as the railway companies are the servants of the great heterogeneous public, provision must be made for feeding people, as far as possible, according to their ability to pay. To subject all indiscriminately to a fixed regulation price for a single meal, whether it be a light or a heavy one, would be unfair, and to serve "refreshments" in the cheap-restaurant, lunch-counter style, would not comport with the luxurious appointments of a dining-car as such cars are now gotten up.

It would seem that as a matter of necessity the station eating-places will have to be maintained for a good while yet, and that trains must continue to stop long enough for passengers to eat as they now do—not in a languid, leisurely way, but in a hurry. There is also an equal necessity for dining-cars. The demand for them, as indicated by the growth of passenger traffic as shown in the figures we have quoted, is constantly increasing, and they will soon become as indispensable in all through trains as smoking and baggage-cars. The running of them may not yield a satisfactory return to the companies in every case, but once introduced, they will have to be kept up or a loud clamor will be raised by the very large class of travelers who appreciate their convenience. Their popularity thus far is obviously not due altogether to the time saved in making stops. Practically, this is a trifling matter, except as it concerns fast mail and express trains, and even these trains, whether they scoop water or feed their passengers on board, to save time, must stop every few hours to try wheels and examine journals as a matter of safety.

The successful running of dining-cars will depend in future, not so much on the attractiveness of their finish and interior arrangement, costly table-ware and elaborate bills of fare, as upon the quality of the cookery. If the

standard is high at the start, it must be kept so, or their reputation will suffer. All hotel and eating-house experience attests that this is a difficult thing to do, especially when the patronage is large and continuous and there is no very serious competition. Deterioration can only be prevented by the most intelligent and watchful supervision. Care must also be taken to avoid the mistake of trying to serve up too many dishes at once. The fare should be select rather than extensive in its variety with the view of catering to everybody's tastes. This will insure better cooking and better service, and the public will very soon learn to distinguish between quality and variety by giving their preference to the former. It is easy to dilate upon the uninviting array of stale and badly cooked eatables spread out upon the average station lunch-counters, awaiting the onset of the next train-load of hungry passengers eager to make the most of the ten or twenty minutes allowed for "refreshments." To divert people from this mode of satisfying the cravings of appetite, the dining-car system must offer something better and not very much dearer in price, with facilities in the way of sitting and standing room that will give no occasion for crowding, rudeness or ill nature. If a lunch service could be provided on these cars for the convenience of such as do not wish or care to pay for a full meal, passengers could then get on the train all that they now get at the dining stations, except the relief of getting out and walking about a little after sitting a long time in crowded cars. So far as the printed bills of fare of some of the Western dining-cars may be taken as a criterion of variety, the "spread" is all that the daintiest epicure can reasonably desire, and if the good things are well served and not all cooked in one pot, these cars are in a fair way to fulfill their mission as a blessing to traveling humanity.

The new dining-cars turned out during the current year are of course a great improvement in every way upon those that were first built, and there is also a corresponding improvement in their management, which is rendering them more acceptable to the class of people for whose convenience they were originally designed. There can be no doubt that they have come to stay, as much so as did the sleeping-cars fifteen years ago.—*National Car Builder.*

QUEER RAILWAYS.

THE average reader, who has not made railway building a special study, will perhaps be astonished to learn that there have been railroads, not only under the ground and in the air, but in the tree-tops and on the ice, while the model of even a submarine railway has been exhibited.

It appears that some time ago a locomotive on sled-runners was constructed in Scotland, and employed for drawing passengers and freight over the ice between St. Petersburg and Cronstadt. The two driving-wheels in the rear were studded with sharp spikes, whereas the front part of the engine rested on a sled which was swiveled, and turned to the right or left by wheels working in connection with an endless screw and a segment rack. From this locomotive, which is said to have run eighteen miles an hour in any direction, the transition is natural to railroads whose ties and track have been laid on the frozen surface of rivers. In 1879, when the mercury stood twenty degrees below zero, a train of the Northern Pacific Railroad passed over the Missouri river on ice three feet thick. The pressure which the ice resisted may be estimated from the fact that the track was laid on twelve-foot ties, and that the cars carried over a quantity of railroad iron as well as a number of visitors. About a year after a similar road was built across the river St. Lawrence at Hochelaga. In this instance a rough road-bed was first levelled in the ice; then crossbeams were fitted in, and on these were placed longitudinal beams which were themselves crossed by the ties that held the rails, water being then pumped over the whole structure to freeze it down.

Even more novel is the idea of grading for a railroad through a forest with a crosscut saw, and laying the ties on the stumps. This has actually been done in Sonoma County, California. Here the trees are sawed off and levelled, and the ties are fastened on the stumps, two of which are huge redwoods standing side by side, and sawed off seventy-five feet from the ground. So firm is this support that cars loaded with heavy logs can pass over with perfect security. It is not generally known that in 1839 no less than fifty-two miles of the projected road of the Ohio Railroad Company was laid on wooden piles which were from seven to twenty-eight feet long, and driven ten feet apart in four rows. No train, however, was ever run over this track. Several wooden-track railways, on the other hand, are actually operated in the United States and Canada. One of these in the province of Quebec is thirty miles long and is used in the transportation of timber. The rails are of maple, and trains are said to run over them with remarkable smoothness at the rate of twenty-five miles an hour. Another wooden-track railway more than fifteen miles long has been constructed on the gradings of the abandoned South Carolina Central Railroad in order to carry the products of turpentine distilleries to a market.

Bicycle railways, where the car-wheels run on a single rail, have been built. One called the "steam caravan" was begun in Syria, between Aleppo and Alexandretta, but apparently never finished. In the case of this experiment the rail was raised on a wall of masonry twenty-eight inches high and seventeen and one-half inches broad. On this one rail were to travel the wheels of the locomotive and the carriages attached, but it was intended to brace the engine and the last car in the train by obliquely-placed leather-covered wheels, running along the sides of the wall, which wheels were further to serve as brakes. A single rail or bicycle railroad has also been built in the United States, and was in operation at Phœnixville, Pa., in 1876. Since that date a two-wheeled locomotive was made in Gloucester, N. J., for an elevated railroad in Atlanta, Ga., but was never shipped, as the road, a portion of which was built at Angier's Springs, near Atlanta, was never completed. With these bicycle-engines may be compared the railway velocipedes, many of which are used on Southern and Western railroads. These, which have a wheel on one rail and two wheels on the other, can be propelled by the feet and hands of the rider at the rate of twenty miles an hour.

There is nothing specially new in the project of atmospheric railways, or, in other words, of propelling carriages in a large tube, by producing a vacuum in front, and applying atmospheric pressure behind. This device has not proved of much practical value, though a tubular road of this kind was for a time in actual operation at the Crystal

Palace, Sydenham. The tube in this instance was of brick, a quarter of a mile long, nine feet high, and eight feet wide, and the car within it was used only for the conveyance of passengers. The piston that propelled the car was rendered almost air-tight by means of a fringe of bristles, extending nearly to the surrounding brick-work of the tunnel and to its floor. A fan, worked by a steam engine, both exhausted and compressed the air. The motion of the car was pleasant, and the ventilation ample.

A flying locomotive was made to justify its name at the aeronautical exhibition in England in 1868. The engine weighed thirteen pounds, and was made to lift itself, with forty pounds in addition, to a height of six inches in continuous flight around the room. The contrivance of a wind-driven chariot, or car with sails, to which Milton alludes in his "Paradise Lost" as having been employed on the plains of China, has, at various times, been made use of on the level roads of Holland. Recourse was had to the same method of locomotion about 1830 on a railroad from Baltimore to Ellicott's Mills. But a much more successful sailing car was invented for the Kansas Pacific railroad, and has been used for years as a hand-car on that road. The mast is eleven feet high, and the triangular sail has two booms. On the plains a speed of forty miles an hour has been attained by this car with the wind right abeam, the sail close-hauled, and the road full of disadvantageous curves.

It will probably be news to most persons that in 1876, at Paris, one Dr. La Combe exhibited the model of a submarine railway which he proposed to lay on the bottom of the Channel between Dover and Calais. On a road-bed of concrete, three galvanized iron rails were to be placed, two for the track and one in the center. To the central rail the car was to be attached by rollers, in order to prevent it being derailed by the waves. The boat-car was to be air-tight, and driven by a propeller-screw worked by compressed air. Fresh air was to be supplied to the occupants of the car by a tube running up to the surface of the water, where it would be affixed to a buoy. Finally, a series of buoys on the surface would mark out the track of the car, which, in case of any accident, could be cut loose below, whereupon it would rise to the surface.—*Southern Industrial Record.*

A BRIEF HISTORY OF ELECTRIC AND MAGNETIC LOCOMOTION.

THE electric motor was invented over fifty years ago, and has been in extensive use ever since. The first inventor is a matter of some dispute, but the invention follows very naturally from the investigations in electro-magnetism made by Professor Henry about 1830.

Probably the first motor giving direct rotary motion was made by Sturgeon in 1832. A number of others soon followed, but the one attracting the most attention, and on which great hopes were based, was invented by Thomas Devenport, of Brandon, Vt., and was fully described in the *American Journal of Science and Arts* for April, 1837. Of his experiments it was said, "One of the machines with a motive wheel only seven inches in diameter has been attached to a turning-lathe, and moves it with astonishing strength compared with the small size of the propelling engine."

We also find the following financial appeal, which to the stock-sellers of the present day must seem an example of untutored simplicity: "For the purpose of raising funds to carry out experiments, etc., a joint-stock association has been formed in New York, of which Mr. Edwin Williams, No. 76 Cedar street, is agent. By this arrangement, the principal interests of the patent for the United States and Europe being placed in a stock of three thousand shares, the proprietors offer an opportunity to public-spirited individuals to become associated with them in the enterprise, which it is hoped for the benefit of mankind may be successful."

Another electric motor attracting wide attention about that time was invented by Prof. Charles G. Page, of Washington, D. C. An account of this motor and its application to locomotive purposes was given in a lecture delivered by the inventor in New York, and printed in the *Scientific American* of November 15, 1851. At that early date electric motors were successfully applied to locomotion, both on land and water. In April, 1837, Sturgeon announced his having succeeded in propelling a boat, and also a locomotive-carriage, by electro-magnetism (see "Sturgeon's Annals of Electricity," vol. i., page 250). In the same publication for October, 1840, are given a cut and description of the electric locomotive of Uriah Clark, of Leicester, England, which was run for two months on a circular track at the Leicester Exhibition of that year. Devenport, whose motor was mentioned above, ran a locomotive in 1842 on a railway near Glasgow. This locomotive, which is described in the lecture by Professor Page, above cited, weighed five tons, and developed one horse-power, attaining a speed of four miles an hour. In this country, about the same time, Professor Page obtained an appropriation from Congress to aid in experiments on this subject, and constructed a locomotive which traveled from Washington to Bladensburg on the Baltimore and Ohio Railroad.

In electric locomotion by water, the most successful inventor was Prof. Jacobi, who, in 1839, propelled a boat by electricity on the Neva.

The following very interesting letter from Jacobi to Faraday is found in the *Mechanics' Journal*, 1839, vol. xxxii., page 64:

"During the past autumn, and at a season already too far advanced, I made, as you perhaps have learned from the gazettes, the first experiments in navigation on the Neva, with a ten-oared shallop furnished with paddle-wheels, which were put into motion by an electro-magnetic engine. Although we journeyed during entire days, and usually with ten or twelve persons on board, I was not well satisfied with this my first trial; for there were so many faults of construction and want of insulation in machines and batteries, which could not be repaired on the spot, that I was terribly annoyed. All these repairs and important changes being accomplished, the experiments will shortly be recommenced. If Heaven preserve my health, which is a little affected by continuous labors, I hope that within a year from this time I shall have equipped an electro-magnetic vessel of from forty to fifty horse power."

In all the inventions I have described, the source of electricity was a galvanic battery carried by the locomotive itself; but others used a stationary generator, and conducted the electricity to the propelling motor by means

of conductors laid along the track or by the rails themselves. Mr. Pinkers, an Englishman, invented, in 1840, an electric railway of this description; from his stationary source of supply the current was led to his moving locomotive by two copper conductors, which were fastened to a beam of insulating material laid between the rails; two sliding blocks of copper depended from the locomotive and rested in contact with the two conductors respectively, and thence through the two blocks the current passed to the propelling motor on the train.

Mr. Pinkers' electric railway is fully described in his English patent, No. 8,644, of 1840. A railway of this kind is described in the *Mechanics' Magazine* for 1847, vol. xlvli., page 559. It was invented by Messrs. Lilly & Colton, of Pittsburg, Pa. In the description it is said: "The power is applied, not to the locomotive, but to the track, and herein consists the novelty of the invention or discovery. Two currents of electricity, positive and negative, are applied to the rails, and thence communicate with the engine. The latter is provided with two magnets, which, by a process of attraction and repulsion, drive the car over the track. Heretofore the propelling power has been used on the car itself; in this instance, however, the power is in the rails, and an engineer may remain in one town and with his battery send a locomotive and train to any distance required." Of a later date is the railway of Bellet and De Rouvre, described in an English patent of 1864, No. 2,681, in which two wires are stretched beneath the car to convey the current to the locomotive; also that of Hallez d'Arros, of Nancy, France, in 1873, in which the inventor in his patent says, after describing his locomotive: "The battery or source of electrical power may be mounted on this carriage, as above described, or it might be fixed in position and the electrical current might be transmitted by conductors laid along the rails, or by the rails themselves."

In the railway invented by Mr. W. H. Knight and myself, which has recently gone into practical operation in Cleveland, in connection with the Brush system, we make no extravagant claims to be the first persons to whom the idea of electric locomotion has come, but we do claim that we have taken up only devices which are free as air to every inventor, and by inventions of the utmost importance have rendered electric railways a practical success.—E. M. Bentley, in the *Scientific American*.

Cheap Fares.

COMMENTING upon the latest British railway returns, the New York *Journal of Commerce* remarks: "American railroad managers should take a hint from the results of the British passenger business by rail in 1883. Running first, second, and third-classes of cars to accommodate various castes and tastes, the British railroad companies find at the end of the year that the lowest grade is by far the most productive in earnings. The official statistics for 1883 show the receipts from third-class travel to have been $85,250,500, against $16,648,500 second-class and $18,350,500 first-class. The gain in third-class for the year over the returns for 1882 is about $3,500,000, and the first and second-classes exhibit a loss in the comparison. The third-class receipts are nearly three times as great as those of the other two classes together. This is an unanswerable argument in favor of cheap travel. It explains in part why the net earnings of the British railroads in 1883 amounted to 4.29 per cent. on an increased capital—a result unexpectedly good. The statistics do not give the comparative cost of running the three kinds of cars in which these passengers were carried, but there is no doubt that the figures, if obtained, would be greatly in favor of the cheapest class. The third-class cars are always crowded, the second-class are only partly full, and the first-class on the mixed trains either go empty or carry much less than their complement of passengers. The prime cost of the better classes of cars is of course much higher than the third, and the wear and tear make a larger bill of expense for refurnishing. If the prejudices of the people did not support this distinction in cars the companies would long ago have abolished the classification and adopted the American plan. The American railroad corporations have yet to learn by thorough and systematic trials to how low a point fares can be put so as to produce the largest net earnings. It is invariably the case that some of those roads which do the most liberal commuting business earn the most money from passengers. They reduce the fare in consideration of the fact that the passenger makes daily trips. But on each trip the company must make a profit, or else the more it commutes the more it would lose. Now, if it pays to take people at reduced rates between two points by the month or for the round trip, why would it not also pay to make that rate applicable to everybody, without regard to the number of trips? This experiment has never been tried except at times when the public has demanded and almost forced it from the companies, as in the case of the great Philadelphia Exposition and other national fairs. The dividends in the years when these fairs were held indicated no decline in net earnings of the companies most affected by the reduced rates, and until the contrary is proved we are entitled to suppose that the experiment was successful. But no company in the United States has ever had the courage and faith to introduce really cheap rates of fare at all times and seasons, with or without competition as an inciting cause. Rivalry may make fares to Chicago, Cincinnati or St. Louis very low for a while, but the companies soon come to an understanding and reëstablish uniform higher rates. What the people want is more reasonable rates to non-competing points, not commutation or excursion tickets, but unconditionally cheap fares. We believe there is 'money in it' to an extent of which the companies little dream."

The Security of Railway Travel.

SPEAKING of the safety of railway travel, the current number of the *Railway Register* says: "In these modern days of the newspaper and telegraph, when occurrences in all parts of the world are chronicled for the information of the people, and when crimes and accidents are described with even too great a minuteness, we often hear of railway accidents—at least it seems to us that it is often. But when we consider the matter further the conclusion follows that the loss of life or limb on the railways does not frequently occur.

"Thousands of passenger-trains are every day swiftly speeding on their way carrying their precious freight of human beings. Millions of people are carried for a greater

or less distance each week and yet how seldom it is that anyone is killed or injured. There is actually as much danger in walking the streets of a crowded city as in traveling from Boston to San Francisco. More people lose their lives in the city of New York in a single year by being run over by horses or vehicles than are killed in accidents on the rail.

"When the annals are prepared and a comparison made, it will be found that more are destroyed by lightning than by railways. The reason of this comparative safety is the perfection to which railway administration has attained. Track, locomotives, cars and appurtenances are of the most approved pattern, employés are skilful and alert so that the traveler rests as peacefully and safely in a Pullman sleeper, running at a rapid rate, as he does in his own bed at home."

Old-time Track.

IN the display of the Louisville and Nashville Railroad at the Southern Exposition, says the Louisville *Courier-Journal*, will be an interesting reminder of the railroad of our forefathers, and the dangers of fast travel fifty years ago will be contrasted with the safety of to-day. The reminder in question is a section of rail and foundation from the Lexington and Ohio Railroad, the second railroad built in the United States which used an iron rail. The rail is simply a flat piece of iron, with holes drilled through it to receive the spikes which attached it to the foundation. There was no such thing as a cross-tie, nor was there any need of one. The foundation was a slab of rock, perhaps two feet wide by one thick, and about seven or eight feet long. This was sunk into the ground, and holes were drilled into it for the spikes. The rail was laid on, the inner side of the stone being chiseled out to fit the flange of the car-wheel. There was but little danger of jumping the track, but the "snake-head" was in its glory, the spikes working loose and the rails turning up at the ends. The section to be on exhibition was dug up near Lexington on the 5th of this month.

Brain Work on Railways.

"M. QUAD" discourses thus to the American boy: "Have you any idea of the millions of money required to build, equip and run a railroad? Have you ever asked yourself how many locomotives, coaches, cars and men such a road as the Michigan Central must keep constantly employed? Did you ever figure on what a fortune it cost each year to keep up all this rolling stock, tracks, stations, tanks, etc.? And think of the perfect system that prevails in all the departments! No train leaves the depot until the gong strikes the exact minute, and from the time it leaves here until it reaches its destination it is under the watchful eye of the train-dispatcher, and all its movements are known through the telegraph. Go down to the depot at 11 o'clock, A. M. and ask the train-dispatcher where the train is which left for the west three hours before, and he will locate it. Every conductor has his orders. He must run by these until the telegraph makes a change. There is a continual click! click! of the telegraph all along the line, and if there are fifty trains on the rails each one makes its run without bothering another. There must be a perfect system, and men must obey orders to the very letter.

"Ride the length of a railroad and you see the piles of rails here, heaps of ties there, old car wheels and scrap iron by the acre, and you must imagine that great recklessness prevails in the financial management. No corporation cuts expenses closer than a railroad. Every tie is counted—every old car wheel has its value—every hundred pounds of scrap iron is looked after. On some roads the engineers are limited as to the amount of oil to be used each trip. It is even figured down just how long a wheel will run and how long an axle will last. People talk about the position of President of the United States as if it demanded great ability on the part of the incumbent. The active superintendent of a first-class railroad exercises five times the brain power required in any political office in the land. Think of the many stations along the route—the rolling-stock—the purchasing, selling and repairing! He may not burden himself with every detail, but he must see that others do. He must have the head to control others' hands."

Death of the Iron Rail Industry.

FROM 1878 to the present time, according to a statement in a recent number of the *Iron Age*, iron rails have been steadily falling in favor, with the exception of a brief interval in 1879–81, when the "boom" gave this dying industry a respite from its inevitable doom. The production of steel rails, on the contrary, advanced with prodigious strides from year to year until the maximum was reached in 1882, since which time the depression in trade that has so seriously affected railroad traffic has caused a falling-off. During this period prices fell to a lower point than ever before known in this country, though while the "boom" lasted they touched high-water mark. The following table shows the condition of the two divisions of the trade from 1878 to the close of 1883:

Years.	Iron rails produced. Net tons.	Steel rails produced. Net tons.	Price of iron rails. Currency.	Price of steel rails. Currency.
1878..	322,890	559,795	$33.75	$42.25
1879.....	420,160	693,113	41.25	48.25
1880.	493,762	968,075	49.25	67.50
1881.....	488,581	1,355,519	47.12	61.13
1882.....	227,874	1,460,920	45.50	48 50
1883.....	64,954	1,295,740	Not quoted.	37.75

This table shows how greatly the iron rail industry has collapsed, the production in 1883 having fallen to insignificant figures, and quotations not being made in the leading rail markets of the country. It will be observed that, while steel rail prices were $18.25 per ton above iron rail prices in 1880, in 1882 the difference was only $3. It is very probable that if we could obtain the prices at which the few iron rails were sold that were made in 1883, they would be found to have been above the steel rail prices given for that year, as other iron products have not fallen proportionately with steel rails.

Novel Stock Floating.

THE *Railway News* states that the Government of Guatemala has hit upon an original method of raising money for the construction of an important and much needed

railway from the capital to St. Thomas, a seaport of the Antilles. The cost of the line is estimated at twelve million dollars, and the Government has determined to obtain the money by making every adult male citizen a shareholder to the extent of forty dollars. Those who are too poor to pay the lump sum will be allowed to discharge their obligation by ten annual payments of four dollars each. Unless there is extraordinary prosperity just now in Guatemala we fancy a good many "male adult citizens" will find it convenient to pay their quota by a process of long division.

American Locomotive Shops.

THERE are at present sixteen locomotive works in this country, not including the shops owned by railway companies. Pennsylvania has five of these, New Jersey and Massachusetts three each, New York two, Rhode Island, New Hampshire and Maine one each. These works give employment to 14,000 men, and every year add about 2,600 to the 20,000 now in daily use. At present five men have to work an entire year to complete one of these huge machines. The past year has been somewhat a dull one for manufacturers, and a majority of the shops are not working full time.

THE Government of India, which controls and operates the greater part of the railway system of that country, has determined to adopt iron freight-cars, and it is advertising for contracts to furnish 1,000 cars made of that material. The specifications published show that the American freight-car design has directly influenced the plans for the new India goods wagons, as they are called. They will be open cars, twenty-five feet long, and will be carried by two trucks. The whole of the cars will be of iron—trucks, frames, and upper work. All parts must be made interchangeable, and to standard sizes.

THE Philadelphia *Record* says that General Manager John E. Wootten, of the Philadelphia and Reading Railroad Company, who is the patentee of the Wootten dirt-burning locomotive, has sold his rights in the patent for a sum estimated between $250,000 and $300,000. The purchase was made by an association of railroad capitalists, who have formed a company, of which Mr. Joseph Wharton, president of the Wharton Switch Company, is the leading man. The purchasers will continue the manufacture of the locomotives under the title of the Wootten Locomotive Company.

THE locomotives of the German Railroad Union in 1862 consumed, among other fuels, 49,827 tons of peat. The Austro-Hungarian roads in the Union burned considerable wood—209,918 cubic meters, against 973,316 tons of lignite and 655,798 tons of coal. On the German roads 97 per cent. of the fuel used (reckoned by heating capacity) was coal; on Austro-Hungarian roads 53⅔ per cent.

THE Massachusetts Bureau of Statistics states that in 1868 the chance of a person being killed on or by steam-cars was one in 5,026,281, while in 1882 it had diminished to one in 20,927,034. This is less than the chance of being struck by lightning, and much less than that of being injured by a kerosene lamp explosion.

Correspondence.

THE MASSACHUSETTS CAR-COUPLING EXAMINATION.

[SPECIAL CORRESPONDENCE OF THE AMERICAN RAILROAD JOURNAL.]

BOSTON, MASS., October 2d.

THE Massachusetts Board of Railroad Commissioners met here on September 25th for the purpose of carrying out their projected examination of car-coupling devices, and they are now preparing their report. There were, in all, one hundred and seventy-five entries made of patent coupling devices, but of this total ninety-five did not exhibit, and the actual number submitted was eighty. Models continued to arrive after the exhibition had terminated, and though not examined by the Board as yet, they will probably receive attention as soon as the members have finished their present arduous duties. I append a complete list of the car-couplers exhibited, and of persons exhibiting car-coupling devices:

Ames' Automatic Car-coupling, Boston; Adams & Felthausen's Self-acting Coupler, Albany, N. Y.; Archer Automatic Coupler, Albany, N. Y.; American Automatic Car-coupler, Boston, Mass.; Burrell Coupler, Camden, N. J.; Barnes Automatic Coupler, Rochester, N. Y.; Bert Car-coupler Company, Denver, Colorado; Thomas F. Byron, Lowell, Mass.; Brown Automatic Coupler, Louisville, Ky.; Coon's Coupler, Boston, Mass.; Beal Coupler, Fernandina, Fla.; Boston Automatic Coupler; Bias Car-coupler; Beacher & Holmes Car-coupler, Moncton, N. B.; George F. Blood, Troy, N. Y.; James W. Cole, Westfield, Mass.; Carsonville Coupler, Abilene, Kansas; Conway Ball Coupler; New York; Chas. K. Cordrey, Bellefontaine, Ohio; Cowell Coupler; Davis & Barnes Cannon-ball Coupler, Abilene, Kans.; Chas. Devlin, Pembroke, Ontario; C. A. Drake, London, England; Davidson's Coupler, Boston; John Depew, Peekskili, N. Y.; Eureka Coupler, Grand Rapids, Mich.; W. L. Everett, New Era Car-coupler, New Haven. Ct.; C. F. Edwards, Tipton, Mo.; Fisher Universal Automatic Car-coupler, Wabash, Ind.; W. H. Flag, Mittineague, Mass.; Hugh Graham, Dartmouth, Nova Scotia; Giffard Automatic Freight-car Coupler, New York; Lyman Hatfield, Manley Howe's Coupler, Boston; Thayer's Assistant Coupler for coupling with link and pin; A. B. Holmes, Scranton, Pa.; Hine Coupler; R. Hitchcock, Springfield, Mass.; Chas. M. Hoag, East Albany, N. Y.; G. P. Hunt, Newark, N. J.; M. R. Hubbell & Co., Wolcott, Vt.; John J. Howe, Janney Coupler, Pittsburg Pa.; Marks' Automatic Coupler, Cleveland, O.; Miss Susan P. Moulton, Salem, Mass.; James McCarn, Lansing, Mich.; Manlick's Automatic Coupler, Beaver Falls, Pa.; Henry Mitchell, Boston; T. B. Nutting, New York, N. Y.; S. Nichols, Boston, Mass.; National Freight-car Coupler, Lynn, Mass.; John Raddin, Lynn, Mass.; Putnam, Hickok & Hickok, Buffalo, N. Y.; Peck's Car-coupler, Columbus, O.; Powell's Perfect Car-coupler, Kansas City, Mo.; Prescott's Automatic Coupler, St. Albans, Vt.; James Schofield, Marshall, Texas; H. M. Sturgis, South Charleston, O.; Skinner's Car-coupler, Flint, Mich.; Stebbins' Coupler Co., Hinsdale, N. H.; Walter Turnbull, New Orleans, La.; Turner's Coupler, Baltimore, Md.; L. G. Tompkins, Lake City, Iowa; United States Car-coupler Co., Boston, Mass.; Union Car-coupler, Boston, Mass.; Universal Automatic Coupler, Raleigh, N. C.; Vance Automatic Coupler, Cincinnati, O.; A. C. Woolman, Robinson Car-coupler, Bellefontaine, O.; Thomas Woods, London, Eng.; Williams' Coupler, Brattleboro, Vt.; Wilson & Walker Coupler, Pittsburg, Pa.; P. Ware, Boston, Mass.; B. C. Brehant, Moncton, N. B.; Geo. F. Bond, Troy, N. Y.; J. R. Titus, Huntington, W. Va.; L. S. Colburn, Oberlin, O.

The Commissioners had a busy time and performed their duties in a fair and impartial manner. The attendance was large, and the best authorities in the country on car-couplers were present. As to the merits of the couplers exhibited, they may be said to have ranged from the highest to the lowest degree, and of course the latter predominated. I say "of course," for the reason that but very few inventors understand the requirements of a safety coupler, and are ignorant of the forces that tend to the destruction of couplers. It is not a difficult matter to construct a model of a coupler that will couple automati-

cally, and this has been done in thousands of ways, and they will act very nicely on a table, and are not bad things to play with. They will not only amuse children, but also men who have grown grey in car-practice. Perhaps the most noticeable feature of the show was to see a dozen or so of the "old-timers" in railroading spend a long time in discussing the merits of a device that bore on its face the evidence of worthlessness. It is a difficult matter to have inventors of couplers understand that couplers will not admit of complicated or delicate parts. The nature of the service they are to perform causes their rapid destruction, and no device that can become deranged or unreliable will be acceptable under any circumstances.

Although there were several automatic couplers that had some features to recommend them to consideration, it may be regarded as certain that but few if any of them will ever come into general use. The thing is getting simmered down to a fine point, and, although there may be some automatic couplers brought into use, they will very likely be those that will couple with link and pin. There is an effort on the part of some "shovers" of automatic couplers to crowd out the link-and-pin coupling, and they brace up their argument by parading the cost of replacing broken links and pins which they say is enormous. They propose to remedy this by forcing the railways to adopt their expensive automatic (so-called) arrangements that do not couple with link and pin. The frequent breakage of links and pins is a good "bracer," both for officials who are paid for their influence and the men who seek their patronage. But if any one will take the trouble to visit some of the shops where links and pins are made by the hundreds of tons, he will discover the cause of so many failures of these coupling attachments. He will see that these links and pins are made of very cheap and poor material and are turned out in the most expeditious manner by machinery. If the material was of a fair quality in the start it is spoiled by being burned by over-heating so as to make it work easily under the forging process. In this way the railways are equipped with pins and links so brittle that breakages are frequent and disastrous. It is considered economy by some railway managers to purchase these appliances at the cheapest possible rates, and this is the primary cause of accidents resulting from failures of these couplings. Some two or three years since I inspected a large pile of broken links and pins and discovered that the material was of very inferior quality, and wholly unsuited for the purpose. Pins and links of proper dimensions, made of good, honest, tough iron, will rarely, if ever fail, and the frequent breakages are only trumped up as an excuse for adopting some other form of coupling where there is more "margin." Indeed, it is these margins that stand in the way of many, if not all good devices for coupling, and is the mountain in the path, which must be removed by the railway commissioners and car-builders before a satisfactory solution of the coupling problem will be reached.

But the Massachusetts Commissioners are laboring earnestly to bring about a reform in car-coupling, and there is an indication that they are not laboring in vain; and it is confidently expected that by March next, the railways and the public will be enjoying the benefits of safety car-couplers.

WM. S. HUNTINGTON.

A Plea for Civil Engineers.

To the Editor of the American Railroad Journal:

DEAR SIR—Not very long since, in the pursuit of professional business, the writer chanced, with several other passengers, to be detained at a railroad station through the many long, weary hours of a winter evening waiting for a delinquent train. We all found some cheer before a blazing wood fire in an adjacent restaurant, and conversation upon various subjects served to while away the time. I should say that this station was in one of our Southern States, and there was one fine-looking old gentleman there whose tongue ran the smoothest and longest, but he was mostly eloquent upon the subject of the late war. A lone Northerner would prudently keep his hash-trap pretty quiet under such circumstances, and take but little part in the talk, and have little to say. However unpleasantly some of the sentiments expressed might grate upon his feelings, our speaker, like the rest, became tired and dozy, and the quiet was suggestive of sleep, when all were startled by his sudden and stentorian announcement, addressed to the host of the eating-house, that he was a minister of the gospel, and hungry, and that he wanted some supper, and he wanted it at half-price! Whereupon he was kindly invited to a meal at that figure without much hesitation. The writer then felt the pangs of hunger also gnawing at his vitals, and suggested to the publican that as he was a civil engineer, far away from home, and traveling about the world, and doing a big heap of good, he also felt that he should have his supper at half price also. He was as cordially invited to the table, but, not having obtained sufficient data in advance, upon which to base an estimate, was unable to determine whether he paid half-price for his supper or whether he got only half a supper.

This little incident has caused this engineer to reflect, and to draw a parallel between the two professions, and to inquire why it is that a preacher should get such a liberal discount, when we have to pay the list price. We certainly have to work harder, when employed, and we are deprived of many of the social and pecuniary advantages which attend his calling. We, however, on the other hand, have no donation parties, and are not forced to accept gifts of a doubtful value in duplicate or triplicate, etc., which we do not need or want, and which are unsalable in any market; and we do not have to go with the variety show business, and ice-cream and strawberry festival business in order to further our schemes, and promote the building of public works. But then again they have one great advantage over us; very few engineers can hope to lay up a sufficient sum to allow them to pass their old age, and the infirmity which usually attend the last years of one who has led a life of exposure, hunger and anxiety, in peace and quiet.

No writer or orator has proposed a society or asylum for aged and infirm engineers, while on every Christmas day collections are made in all the churches for the preachers who are on the retired list.

Therefore as our necessities are fully as great, and our merits and virtues perhaps even greater, there should certainly be a provision made for those of us that are no longer able to shoulder a tripod, and stake out railroads and corner lots, color meerschaum pipes and test whiskey. Those of us who are becoming grey and bald-headed should make an early and earnest effort in this direction, and see to it that we don't get left. The writer is thankful to the Southern clergyman who unconsciously has led to this train of thought, and the consequences which may arise from its suggestion.

Let us, brethren, bestir ourselves and endeavor to organize a society of a similar kind for the unfortunate and impecunious who swell our ranks. Let us work with zeal, fervor and unction. "Tarry not by the wayside," balancing your levels but disregarding your hind sights, cut the bottom of the rod at every lick with your forward sights, and you will soon mount onward and upward, and our labors will be rewarded in our declining years by comforts and luxuries of which most of us have hitherto been totally ignorant.

I. PONTIFEX, S. I.

An Anecdote of "Old George."

WHEN coals were first carried by railways on the then London and Birmingham line, they were sheeted down for fear they would be seen, it being thought beneath the dignity of a railway company to carry minerals. An indignant objection was at first made to their being carried at all, and it was reported to George Stephenson that Mr. B——, of the London and Birmingham line, had said: "They will want us to carry dung next." On hearing this, "Old George's" anger was aroused, and he replied, "You tell B—— from me, that when he travels by rail they carry dung now!"

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STILL AGAIN.

FOR the fifth time we would call attention to the fact that the AMERICAN RAILROAD JOURNAL stands alone among all railway publications as a monthly magazine and review. Able contributors discuss the current railway topics in its columns, and a selection is made, in every number, of several interesting articles from its contemporaries. We believe that this publication is now filling a void that has long existed, and that the railway world is of sufficient importance to be furnished with other publications than mere technical, financial and news journals.

An examination of the numbers of the JOURNAL from that of June up to and including the present, will show that twenty-two contributed articles have appeared in its columns on subjects of contemporaneous interest, furnished by competent writers. Our staff of contributors continues to widen but we are always ready to examine contributions on railway and tramway subjects irrespective of their authorship, and if they are well-written and of interest to our readers, we will accept them and forward payment for them upon their publication. The invitation thus extended to aid in making the JOURNAL a valuable magazine for railway and tramway men, is addressed to every reader; and its acceptance may be entered into with the knowledge that all satisfactory labor will meet with honest remuneration.

A USEFUL DISTINCTION.

OUR valued contributor, Mr. W. W. HANSCOM, takes us to task in a recent letter for our distinction between the signification of the terms "traction" and "propulsion" as exemplified in an editorial in the Tramway Department of the July JOURNAL contrasting the two motive forces. He says:

"I received the JOURNAL for July and note your article on 'Traction or Propulsion.' I judge that you consider my use of the term 'Propulsion' in reference to cable railways as not strictly correct, and that it should be 'Traction.' I am satisfied that I was wrong in using the word 'Propulsion,' as I find by Webster that it means pushing, while 'Traction' means pulling.

I had been much accustomed to the use of the word in connection with the construction and movement of vessels, propellers, etc., and used the words in a general sense without exercising any intentional care with reference to the meaning of words used, but permit me to inquire as to whether any train of cars, or a single car is not drawn, whether the motive power be a horse, locomotive or stationary engine. In one case, that of the horse, the connection between the motive power and the car is that called the traces, which corresponds to the coupling or draw-bar between the locomotive and car, and in the case of cable railways the connection between the motive power and car is the cable. In two cases the motive power moves, and in the other it is stationary. The cable is not the motive power any more than the traces for the horse or the coupling for the locomotive. Now I should say that if you put the horse or locomotive behind the car you might propel them, as I understand Webster's definition; or a screw propeller, or paddle-wheels propel a vessel, or a locomotive propel itself, or a horse propel himself, or a man by pushing a wheelbarrow, propel the barrow by pushing. The cable is not the motive power in the general acceptance of the term, as we apply that to the engine and boilers. All articles that I have seen in reference to the force exerted by a locomotive to draw or move a train of cars speak of it as tractive and not propulsive force, and I cannot see that a steam-dummy is a fair

example of propulsion as a motive power for tram-cars. If your article was intended as a distinction between cable and locomotive, or horse, in using the word propulsion, one being propulsion and the other traction, I must beg leave to differ from you."

It is quite possible that competent authority would sustain Mr. HANSCOM in the position he has taken with reference to the signification of the two terms. Strictly speaking, a steam-dummy is a power of traction as well as a cable or a team of horses, since it pulls the car behind it, but it was not in that sense we used the term as contradistinctive to traction. It is the *sine qua non* of traction that the power should be in advance of the vehicle, and thus it is undoubtedly true that a locomotive is tractive when applied to the carrying of cars, but is at the same time propulsive when it is considered alone. A locomotive propels itself and it is evident that it would be absurd to speak of it as pulling itself. In propulsion it is an essential that the vehicle must carry the power with it, and under this definition it is manifest that a cable could never be a method of propulsion. Steam, springs, hot air and electricity—even wind and water can act as propelling forces, but we fail to see that a rope, or cable, or a horse could act in this capacity. It is also true that all of the first named forces can be tractively applied, but in order to accomplish traction they must first be given a propulsive action. Thus a cable road is operated by a tractive cable and this cable is operated by a steam-engine, but the engine must first be propelled before the cable is given the power of traction. A locomotive pulls a train of cars but it must first propel itself before it furnishes a tractive power. But the direct action of steam and electricity and other of the first-named forces is propulsive while the action of cable or horse is invariably tractive.

In the case of the steam-dummy and of the locomotive we are given two familiar examples of purely propulsive forces; but when before a car or a train of cars they are tractively applied. On the contrary, when in the rear of a car or a train of cars they are propulsively applied. But from whatever point they are viewed a cable or a horse is purely tractive in its action. The force is invariably exerted backward and the vehicle is behind the power. Propulsion acts *from* a point and traction *to* a point. We know no simpler epitome of the difference between the forces.

There may be little gained in the preservation of this exact distinction, conversationally applied, but there is much utility in bearing this distinction fully in view. As before stated we look for little further results from the investigation of traction save in the details of its application. Traction requires a preëxisting force and this force is generally propulsive. To us it seems that the chief results are to follow the direct application of propulsive force without an intermediary tractive application.

We admit Mr. HANSCOM'S criticism to be just when he alludes to the use of the word propulsion as applied to a steam-dummy attached to a tram-car as incorrect according to our own definition; but the steam-dummy in itself is a purely propulsive power and it was in this sense that we spoke of it. We also claim that the use of the word propulsion as applied to a cable road or horse road can, under no circumstances, be correct, and this claim Mr. HANSCOM candidly allows in the first portion of his letter. In this position we are etymologically sustained. Propulsion is derived from the Latin *pro*, forward or ahead, and *pellere*, to drive, while traction is a simple derivative from the Latin *tractere*, to draw or pull. The distinction between these terms as applied to motive power is, to say the least, advisable, and the application of the word propulsion should be strictly limited to those motive powers which come within the requirements stated above.

THE MASSACHUSETTS CAR-COUPLING EXAMINATION.

IN another column a special correspondent of the JOURNAL reports the examination of car-coupling devices by the Massachusetts Board of Railroad Commissioners on the 25th of last month. As yet the Commissioners have not prepared their report, and we are a little in doubt as to the precise turn it will take. Evidently they cannot demand that any one of any number of couplers shall be adopted by the roads under the jurisdiction of the State, and the utmost limit of their power would seem to be reached when they endorse certain couplers as possessing the necessary requirements, and recommend their adoption. Beyond this it strikes us as impossible for the Commissioners to go, and this limit of power is commendable. It is eminently proper for a State to prescribe that all railways under its jurisdiction should employ safety couplers on their cars, and it is also permissible for the State authorities to rule out certain devices as not filling the requirements of safety; but it would be manifestly wrong were they given the power to compel the railways to adopt such devices as they—the authorities—may deem the best. It is fair to presume that railway managers are more capable of discerning the merits of the devices than the Commissioners themselves, and it is also just to assume that they would be quick to adopt measures to secure safety to their employés.

With this limit of power it is somewhat difficult to see the precise benefits which will accrue from the long-talked-of examination, other than the demonstration of the utter impracticability of the great majority of coupling devices; but if this end alone is attained the labors of the Commissioners will not go for naught. Railways have long suffered under the infliction of the car-coupling mania, and the ordinary inventor seems unable to comprehend the fact that an automatic coupler is not the chief desire of every railway to obtain. Any intelligent railway mechanic in the space of half-an-hour could devise a dozen

car-couplers all of them superior to the majority of devices that every week litter the pages of the *Patent Office Gazette*, but the fact remains that the primitive link-and-pin coupling is the best in the world in theory. It is not essential that the coupling shall be *automatic*, nor in fact would such action be regarded as very desirable. The chief end desired in a coupler is that it shall be *safe*, and thus these patents which have for their object the application of the link-and-pin coupling in a manner that will insure safety to the train or yard-hand conducting the operation, seem most likely to reap a harvest for their proprietors.

The Massachusetts Commissioners have doubtless been edified by the examination of coupling devices of varying degrees of merit, but we should think that they would be puzzled in making a report. They may recommend a dozen or two of the most meritorious devices that were submitted to them, but they must be aware that any railway could provide equally good devices without the necessity of paying a royalty for their use. In fact, the chief benefit resulting from their examination will be the awakening of interest in the subject of safety couplers and the doing away with the vain search for an automatic coupler that will be adopted by every railway regardless of its cost, which seems to have been the El Dorado of railway inventors.

MR. HENDRICKS'S GRAND ACHIEVEMENT.

SOME months ago we announced the JOURNAL'S strict neutrality in the Presidential campaign, and under ordinary circumstances we would have pursued the even tenor of our way, undisturbed by the political clamoring of the multitude, had not a candidate of one of the great parties performed a deed that not only wins our warmest admiration but carries us enthusiastically to his support. We allude to the Hon. THOMAS A. HENDRICKS, of Indiana, the Democratic candidate for Vice-President of the United States.

The act in question was simple and unostentatious. In performing it this truly great man little thought that the deed would call forth the admiration of two hemispheres, and that from that moment he would become the cynosure of the eyes of *savants* throughout the civilized world. To state in brief the marvellous achievement of Mr. HENDRICKS, we will simply refer to a telegraphic despatch recently received from Ohio, announcing that while awaiting a train in a railway station, he deliberately ate three sandwiches at the adjoining restaurant.

The railway sandwich has long been recognized as one of the most deadly substances in existence. HERODOTUS mentions the fact of one being eaten by a Grecian warrior who survived, but the narrative is commonly supposed to belong to an age of legend and is not generally accepted as true. There was even mention of a similar case supposed to have occurred in Massachusetts as late as 1834, but this, too, is viewed in the light of a newspaper story and is doubtless purely without foundation. To Mr. HENDRICKS belongs the undisputed honor of being the first to accomplish this wonderful achievement before witnesses, and with authentic proof.

The existence of the railway sandwich and its spread throughout the country has long been a source of terror to the people and of anxiety to the medical fraternity who have been able to cope with it successfully. The railway companies claim that they have done their best to stamp out the germ, but this statement is received with doubt, and it is even hinted that they have wilfully contributed to the spread of the pestilence, and should be severely punished for their malignity and premeditated slaughter. Certain it is that during the year 1883 there were 8,760 authentic cases of death recorded from the railway sandwich, and if the railways are guilty of the infamous crime imputed to them, they should be remorselessly punished.

The investigation of the peculiar properties of the railway sandwich has long been the study of scientists. Professor DOREMUS, of this city, recently gave the following analysis of its ingredients in one hundred parts:

Leather	79.06
Vitalized Marble	18.17
Bread	2.76
Ham	.01

He concludes his analysis with the remark that "the railway sandwich is the most fatal substance known to science, and as yet there has been found no antidote that will avert its fatal effects." Professor DANA, of Yale College, the noted authority on arsenical poisoning, has also entered into an investigation of the railway sandwich and his analysis shows slightly different results from that of Professor DOREMUS, in giving an increased preponderance of leather, and a "slight trace of butter." Like his brother scientist, Professor DANA announces the railway sandwich to be "a substance which when taken into the human system is absolutely and unvaryingly fatal in its action."

Up to the present time Mr. HENDRICKS has shown no ill effects from his daring feat, and it is currently thought that he will survive. If such be the case there can be no further question as to his fitness for the exalted position to which he has been nominated. A man who shows such superhuman courage is preëminently accoutred for the task of controlling this vast commonwealth, which is a contingency of his election, and unless his Republican rival, General LOGAN, can match this accomplishment by an equally daring act, we give our hearty support to the great and only HENDRICKS. To this extent we retract our original position of neutrality and gladly enter the political arena.

EDITORIAL NOTES.

THE refusal of the Pennsylvania Railroad to allow the Baltimore and Ohio to run their through trains over the former's tracks after the 12th of the present month is the latest development in connection with the complex relations of the two roads. It is thought that this action will hasten the arrangements of the Baltimore and Ohio to connect their line with that of the Philadelphia and Reading, and thus reach New York by way of the Jersey Central Division. Whatever may be the outcome, an active railway war is promised and the situation is one of lively interest.

* * *

THE conference of scientists now being held in Washington to determine upon the adoption of a universal prime meridian of longitude, is rightly attracting attention from every civilized country. The absurd practice now in vogue of nearly every nation reckoning longitude from its own capital or from some prominent point in its own territory cannot be too quickly discontinued, and in the interest of navigation it is to be hoped that a single standard meridian will be adopted by every civilized power on earth. This is not the occasion for the exercise of miscalled patriotism, and there seems to be no reason why all nations should not adopt the Greenwich standard. From the extent and diffuseness of British territory as well as from the rank and importance of the British nation, it is eminently proper that their standard should meet with general adoption. It is understood that France will make it the condition of her adoption of the standard meridian, that the metric system of weights and measures shall be adopted by other nations; but while the metric system is infinitely the best ever devised, it does not strike us that this is the time nor the place to urge its adoption, and above all to employ it as a condition of the establishment of a standard meridian of longitude. Another commendable feature of the conference is the proposition to do away with the suffixes "East" and "West," and to reckon longitude entirely in one direction. Thus there would be three hundred and sixty degrees of longitude, the degree of 0 and that of 360 coinciding. This would be a common-sense improvement, and its advantages are manifest.

* * *

THE Sons of the Revolution, an organization composed of the descendants of those who fought for the independence of the United States, have actively undertaken the task of collecting funds for the completion of the Bartholdi Statue pedestal. So far they have met with encouraging success, and several thousand dollars have been turned in for this laudable purpose. The Sons of the Revolution have gone about the matter in a sensible way and are personally soliciting small subscriptions. It is a national humiliation that the pitiful sum needed to complete the fund should be so difficult to collect, while thousands and even millions of dollars are poured into the treasuries of political parties for "campaign expenses;" but we feel assured that the necessary money will be raised by the time the statue is ready for erection. Were the statue to be brought to this country and placed where it could be seen as a constant reminder of our stinginess, we believe the people would be shamed into subscribing the necessary amount in a very short space of time.

* * *

AMONG other successful railway conventions held last month, was that of the Master Car-Painters' Association, in Boston. This organization is rapidly gaining in strength and membership, and deserves the hearty coöperation of the railways. Car-painting has now become an art by itself, and the discussion of methods by the leading car-painters of the country cannot fail to be of benefit from an artistic as well as from an economic point of view.

* * *

ENTERPRISE is indeed thriving among car-builders when they come to building passenger-cars with bay-windows. Such cars are now being built for the Pennsylvania road and we presume will soon be quite common. In time, we suppose, Queen Anne cars will be introduced, and the good work will go on until the passenger-car will be a miniature residence and the compendium of all convenience. Then will come theater-cars and opera-cars—there are already church-cars—and gradually the American people will conclude to live on the rail. Truly this is a great age we are living in.

* * *

THE Court of Appeals of New York State has confirmed the decisions of the lower courts in the suit brought against the trustees of the Brooklyn Bridge for damages resulting from the fatal blockade of May 30th, 1883, and a half-million of dollars is thus supposed to have been saved the trustees in the avoidance of litigation and payment of damages. There was no evidence adduced tending to show that the trustees had been derelict in their duties as regarded their placing a proper police patrol on the Bridge, but a fine opportunity is nevertheless afforded for the blatant anti-monopolist to pour out his vituperation on another "grasping corporation."

* * *

THE public are at present very much interested in the war of rates that the Western trunk lines have recently inaugurated. Naturally the public are the sole gainers by the warfare and the bigger the fight the better they are pleased. One of the great mysteries to the uninitiated is the precise advantage which railways obtain in a slaughter of rates, but so long as the corporations are the losing parties there is little complaint.

Tramways.

American Street Railway Association.

President.—William H. Hazzard, Brooklyn, N. Y.
First Vice-President.—James K. Lake, Chicago, Ill.
Second Vice-President.—George B. Kerper, Cincinnati, O.
Third Vice-President.—D. F. Longstreet, Providence, R. I.
Secretary and Treasurer.—William J. Richardson, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

THE "JOURNAL" AND THE AMERICAN STREET-RAILWAY ASSOCIATION.

OF all the numerous railway publications, the AMERICAN RAILROAD JOURNAL is the only one that has steadily devoted a liberal portion of its pages to the consideration of street-railways and the numerous problems and questions relative to their proper conduct and management. The establishment of our Tramway Department ante-dated the formation of the American Street-Railway Association and during the existence of this organization we have been quick to chronicle any items of news connected therewith, and to place before its members the latest and fullest information concerning tramway progress that could be obtained. We have published in full, the reports of the Conventions, and in numerous editorials have advocated membership in the Association. A talented staff of writers have contributed articles on all those subjects directly appertaining to tramways, and we have fully described the latest and most useful tramway devices lately devised and patented. Elaborate articles have appeared on the subject of Street-car Painting, and the new Cable Traction System has been fully described in our columns in an illustrated series of articles on the subject by the leading tramway engineer of the country. This latter series is completed this month and we have made arrangements for the appearance of an illustrated descriptive article on the Electric Motor System, to be prepared by a practical electrical engineer. During the year past the JOURNAL has been favored with a number of communications from prominent persons connected with tramway management, and several columns of notes, and items of news and interest have also appeared.

Beginning with the JOURNAL for October, 1883, one year ago, an examination of that and the successive numbers up to the present will show that in all we have devoted *seventy-five pages*, or *one hundred and fifty columns* to our Tramway Department, an average of nearly *twelve columns in every issue.* During that same space of time *forty-five illustrated cuts* have appeared in our columns relative to tramways, nearly all of which were prepared expressly for our columns and at our own expense. The Department for October, 1883, commenced with an editorial leader relative to the then recent Convention of the American Street-Railway Association, and following, came several editorial notes, a paper on the Cable System, a communication on the Philadelphia Cable Road, a description of an old Car Grip, a full report of the Convention of the Street-Railway Association covering six pages, a list of patents granted during the preceding month for tramway devices, a communication from our valued correspondent, Mr. A. W. WRIGHT, of Chicago, a number of tramway notes and items, descriptions of a patent street-car fender, turn-table, horse-shoe, three car-starters and a harness saddle. The November JOURNAL contained in its Tramway Department a number of brief editorials, the first of a series of valuable illustrated articles on Street-car Painting which continued through four numbers, an interesting comparison between English and American Street-Railway Construction, several communications, and a number of illustrated descriptions of tramway patents. The succeeding numbers up to June of the present year devoted equal space to the Tramway Department and presented numerous illustrated articles on Street-car Painting, Tramway Traction, Track-construction, Tramway Inventions, and many columns of tramway news and editorial comment.

With the June issue of the present year, the JOURNAL passed into different hands, and a renewed interest was taken in the subject of tramways. The Tramway Department of the June number contained an editorial advocating the construction of Tramways in lower New York City, the first of an illustrated series of articles on "Cable Railroads" by Mr. W. W. HANSCOM, of San Francisco, the competent engineer in charge of the construction of the new cable tramway in London—which series is completed with the present number, having run through five successive issues and been illustrated with twelve cuts—articles on a New Tramway Locomotive, British Tramways, a Skidless Tram-rail, the Market Street Cable Road in Philadelphia, and a number of tramway news notes. The Tramway Department of the July JOURNAL contained an editorial on the subject of Traction or Propulsion, a further editorial on Cross-Town Tramways in New York City, the second illustrated installment of Mr. HANSCOM'S series on Cable Roads, a communication on the subject of Steel Rails, articles on the subjects of Glass Pulleys for Cable Roads and Tramways in France, with numerous tramway news items and notes. The Tramway Department of the August JOURNAL contained an editorial on the subject of the proposed Surface Road on Broadway, the third illustrated installment of Mr. HANSCOM'S series of contributions, a description of the new Electric Tramway in Cleveland, and of the new Cable Tramway in London, a brief mention of the action of the authorities with regard to the Broadway Surface Road, and the usual installment of tramway news in the form of notes. The

Tramway Department of the September JOURNAL contained an editorial on the subject of the approaching Convention of the American Street-Railway Association, another on the Broadway Surface Road Franchise, the fourth illustrated installment of Mr. HANSCOM'S contributions, the report of an interview with Secretary RICHARDSON relative to the approaching Convention of the Street-Railway Association, a report of the second annual Convention of the Street-Railway Association of the State of New York, a description of the electric tramway at Coney Island, an item regarding Mr. CORBIN'S offer to the cities of New York and Brooklyn to operate the passenger railway of the Brooklyn Bridge, and the customary tramway news notes. The present issue of the JOURNAL speaks for itself, and it is unnecessary for us to enumerate the contents of its Tramway Department. During the entire period since October of last year the names of the officers of the American Street-Railway Association have been kept standing at the head of our tramway columns.

Upon our Tramway Department we have expended more time and trouble, and been put to more actual expense than upon any other department of the JOURNAL, while the receipts directly traceable to this department are immeasurably smaller than those from any other. In truth the maintenance of the Tramway Department of the JOURNAL has cost more than it has brought in the way of legitimate business, and it has been, and is still being conducted at an actual loss. Nevertheless we have no intention of discontinuing it, for there is every indication that it has met with a *succes d'estime*, if no other, and we honestly believe it is of the greatest benefit to the members of the American Street-Railway Association and to tramway managers and officials throughout the country. All that is asked is that our labors and efforts in behalf of tramway interests shall be recognized by the substantiation of our claims to be the organ of American tramways. We seek for no subsidy nor do we ask that a certain sum be granted in the way of subscriptions or advertising, but we do request that all those tramway managers and officials who deem our Tramway Department to be of value will recognize the AMERICAN RAILROAD JOURNAL as the organ of their interests. There are probably other publications that might claim this distinction as properly belonging to them, but we will only too cheerfully submit to a contrast of our Tramway Department with their own. The JOURNAL was the first publication to recognize the interests of street-railways by the establishment of its Tramway Department, and it is likewise the only railway publication to-day that is consistently maintaining its department from number to number and possessing a regular editorial and contributing staff of writers for this department. With regard to the American Street-Railway Association, the JOURNAL is preëminent in the fact that it was the first publication to recognize the Association as a factor of great interest and value to American tramways, and the only one that has kept its existence in the minds of its readers by frequent editorial comment and news items.

If we have been able to substantiate our claim to be the virtual organ of the American tramways, our end is accomplished. We believe that if this fact is established, the JOURNAL will receive an actual endorsement as their official organ and that of their National Association, but should we be mistaken in this surmise it will make no difference in our future course. The JOURNAL will continue to be the virtual organ of tramway interests even if it fails to receive the official recognition which it deserves.

STREET-RAILWAYS IN THE COURTS.

AN interesting feature of the work performed by the American Street-Railway Association during the past year is the preparation in brief of a number of judicial opinions and decisions affecting the interests of street-railways in the United States and Canada. Through the courtesy of Secretary RICHARDSON, we have been furnished with a complete file of these decisions as published by the Association, amounting in all to seven.

As might be expected the street-railways are the defendants in the majority of cases, there being but one instance where the corporation is on the aggressive. In every case where the street-railways are the defendants, suit is brought for personal injuries resulting to the plaintiff, and in each case a judgment favorable to the corporation was rendered. We desire no better evidence to demonstrate the irrational character of the warfare which the public wage against corporations, and the absurd theories prevalent that injuries resulting through the carelessness of the injured form a case against the street-railway companies. The one case in which a street-railway is the plaintiff, is an action against a teamster for obstructing the company's tracks, and the judge's charge is given in favor of the company.

The papers are prepared with care and at the expenditure of considerable time and money, and they have been forwarded to every street-railway company in the country irrespective of whether they were members of the association or not, but we understand that this wholesale distribution is to be discontinued in the future, and very properly so. Every street-railway is interested in these cases, and if they desire to profit by the distribution of the opinions and decisions they should acquire membership in the Association and thus contribute to this and and other beneficial undertakings which the organization is maintaining. The expense attending such membership is very small, and entirely out of proportion to the bene-

fits which will accrue from a union of street-railway interests, and with this fact in view the apparent slowness of the companies to join is a matter of surprise. As a simple investment, a membership in the Association is certain to realize ample returns.

QUAINT old Philadelphia has at last been caught by the spirit of reform and the reduction of street-railway fares from six to five cents is being actively agitated in that city. Several companies announce themselves as ready to make the desired reduction, and of course it will be but a question of a very short time before the others follow suit. We believe that this reduction would be a wise move for the Philadelphia roads to make. It is essential that the fare upon a city road patronized regularly twice a day by thousands of persons, should be an even sum; and it has been demonstrated time and again that a uniform fare of five cents on the street-railways of populous towns is the most profitable figure for the companies. Philadelphia has in all probability as many miles of street-railway in active operation as any city in the country, if not more, and considering its size and importance it has been decidedly slow in introducing the five-cent fare.

* * *

THE abolition of bells upon tram-car horses is being considered by the authorities, much objection to them having been manifested, especially in large cities. We should not suppose that tramway managers would oppose their abolition, for the tramway bells are an undoubted nuisance and of the smallest possible benefit either to the roads or to their patrons. Upon tramways that run a dozen or two dozen cars an hour, the use of bells is entirely superfluous.

CABLE RAILROADS.

(Concluded.)

BY W. W. HANSCOM, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE second cable road projected and constructed as such was the California street road, which has a length of about two and three-eighths miles. Its general arrangement of track and terminal provisions for switching, as well as the grip, were copied from the Sutter street road. The gauge of the track is three feet six inches. The tube is made of concrete, with skeleton frames—made from old rails—supporting the track and channel irons forming the slot.

Fig. 1 shows the general form and arrangement of the skeleton frame supporting the rails and slot-irons. These frames are put in place in the excavation and the slot-irons and rails are then fastened to them, while after being wedged up in line, mold-boards to form the interior of the tube are put down and the concrete filled and rammed between the mold and the bank, the thickness of the concrete being from eight inches to one foot. When sufficiently set to retain its form, the molds are removed from the concrete and placed along another section, when the operation is repeated. The form of the tube depends upon the shape of the grip and the room which it requires for manipulation. From just below the bottom of the channel-irons forming the slot to about the center of the sheave which supports the cable, its form as shown in the illustration, is that of an inverted cone, and the bottom part of the tube conforms to the shape of the wrought iron skeleton.

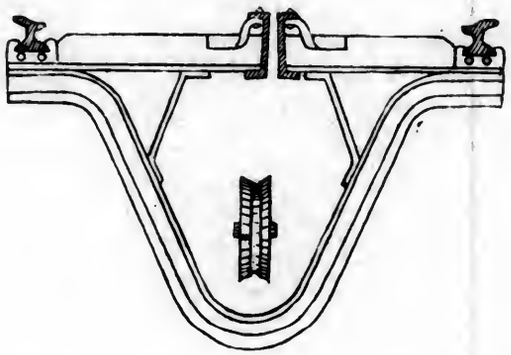


FIG. 1.

The driving-drums (which are like those used on the Sutter street road) instead of being placed in the engine-room, as on the Clay street and other roads, are located under and in the same vertical plane with the cable in the tube, the drums being connected by spur gearing to a line-shaft which extends to and over the engine-shafts. The cable is divided into two parts which meet at the engine-house, one part running East and the other West from the driving-drums. Tension sheaves for taking up the slack both from the incoming and outgoing sections of the cable were constructed for this road, and were intended to be automatic; but a short period of use demonstrated that sheaves for this purpose on the incoming cable were unnecessary, and the carriages supporting the tension sheaves were fastened in one position, leaving the automatic action to be performed by the sheaves on the outgoing section of the cable. This arrangement has been found to meet all the requirements.

There are two vertical engines with inverted cylinders, twenty-two inches diameter by thirty-six inches stroke, each with automatic cut-off, regulated by the governor. Each engine has a sliding pinion on its shaft which may be put into gear with a spur-wheel on the inner end of the line shaft which connects with the driving-drums. The piston speed is 528 feet per minute, which is the same speed as the cable, viz.: six miles per hour. The boilers, three in number, are of the locomotive fire-box style, and are arranged to connect either or all to the main steam-pipe. Only two are required for the work at a time, the other being in reserve, and a change of one boiler is made each week so that each boiler is laid off and cleaned every third week. The engines are not changed regularly, the one in present use having been run for a little over a year.

The grades on this road are heavier than on Clay street, and a larger cable is in use, being one and one-quarter inches in diameter. Various kinds of material have been made into cables for this road for the purpose of finding the most suitable and economical. Crucible steel cables have, so far, proved the most satisfactory,

The latest constructed cable road in San Francisco is that known as the Market street road, although it runs over five different streets. The route originally was through Market and Valencia streets, and the road was built in 1860, steam dummies being used for seven years, when they were abandoned and replaced with horses which were used until last year, when the cable system was adopted, and roads were constructed on Haight, McAllister and Fulton streets to connect with the Market street line. The diagram (Fig. 2.) shows the direction of the streets, with the location of engine-houses and turn-tables at the termini. The cables running through Market, Valencia and Haight streets are driven by the engines in the engine-house at the curve which joins Market and Valencia streets, and the cables running through McAllister and Fulton streets are driven by the engines at the angle formed by the intersection of these streets. The length of cable driven by the Market street engine is about 65,000 feet, while on McAllister and Fulton streets the engine drives about 25,000 feet, the cables being all one and one-

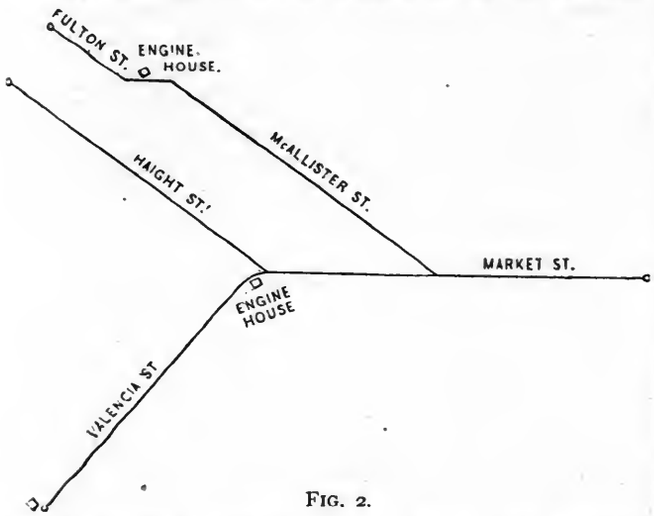


FIG. 2.

quarter inches in diameter. As the Market and Valencia street portions were converted while in use, the cost was greater than if new roads had been built, as temporary turnouts and switches were required. The lengths of the Market and Valencia street cables are together about eight and one-half miles, or about four and one-quarter miles of double track; the Haight street cable about two miles, and the Fulton and McAllister about two and one-half miles of double track. The cars for these roads are so constructed that the grip is placed at one end, and the cars are required to be turned round at each end of the route. Turn-tables having a double track are used, and one track being in line with the incoming track is brought in line with the outgoing track when the table has been turned half-way round. The cars themselves are partly open and partly closed, so that a passenger may ride exposed to the weather when pleasant, and in the closed and protected part when unpleasant or stormy. The cars are all turned at the lower end of Market street, as this is the point to which all the cars run from Fulton, McAllister, Haight and Valencia streets, and the other termini are at the ends of Valencia, Haight and Fulton streets.

The driving-gear and drums are the same in both engine-houses as those on the Sutter street road, but heavier, as the cable is one-quarter of an inch larger and there is much more of it. The engines for the Market street engine-house are the same kind and style as those on the Sutter street road, having been made by the same builders. The engines are compound, non-condensing, with diameter of cylinders twenty-four and thirty-four inches by forty-eight inches stroke, making fifty-four revolutions per minute; the gearing being so proportioned that with this speed the cables move eight miles per hour, or 704 feet per minute; the piston speed being 432. There are two sets of engines, each having a sliding pinion on the engine-shaft that can be put into gear with a spur-wheel on the line-shaft which carries all the driving-drums. The duplicate engines are for reserve, as on the other roads. The boilers are the Babcock & Wilcox—four in number—arranged in sets, two in a set, and either or both sets may be in use at the same time.

At the McAllister and Fulton street engine-house, two single engines are arranged so that either may be used singly, or both together; the cylinders are eighteen inches diameter by forty-eight inches stroke, and make fifty-four revolutions per minute, the same as those on Market street, and the cables run at the same speed. Four plain round tubular boilers are in use here for steam, set in pairs and connected as at other places so that either set may be used separately, or both pairs together.

These examples of cable railroads will serve to illustrate the advance that has been made in the method of moving street-cars. While there are yet many improvements to be made, and many changes in the detail to adapt this system to meet the varying local conditions and requirements, it has nevertheless proved a great benefit to San Francisco, and a safe means for conveying nearly twenty-five millions of people yearly; and has not only proved profitable to those investing in them, but it has added many millions of dollars to the taxable value of the property in this city. The same common sense and honest and intelligent management used in the construction of cable railroads that would be expected in the construction of any other railroad or manufacturing enterprise will surely bring due returns for the money invested.

DO SURFACE ROADS OBSTRUCT TRAFFIC?

BY F. MARTIN GAYLER.

[Written for the AMERICAN RAILROAD JOURNAL.]

WHILE in hearty accord, as a rule, with the position of the AMERICAN RAILROAD JOURNAL relative to the discussions of problems connected with tramways, I must take issue with it on the question of the obstruction of traffic on busy thoroughfares, by surface roads. The JOURNAL has conspicuously opposed the construction of a surface road upon Broadway chiefly for this reason, and in the last number it announces itself as fairly open to conviction as to the error of its opinions, but squarely states that it has not yet met the argument that will convince it. If permissible, I would like to undertake the task.

I do not, be it understood, argue in favor of the construction of a surface road on Broadway, in particular, nor will I enter at all into the absorbing questions as to the advantage of the sale or gift of the franchise for that purpose; but I take issue with the JOURNAL, or with its editorial writer who on that occasion spoke for it, on the im-

plied proposition made that a surface road upon a crowded thoroughfare was a hindrance to traffic. On the contrary I will as squarely lay down the broad proposition, and endeavor to give it satisfactory demonstration, that a surface road upon a crowded thoroughfare is a great aid and assistance to the maintenance of uninterrupted traffic. I will premise my argument by quoting a few lines from the editorial in the August number of the JOURNAL entitled, "Is a Surface Tramway on Broadway Desirable?" Its undesirability is chiefly claimed in the following sentences excerpt from the article in question:

"The casual observer cannot fail to note the frequent jams and blockades which daily occur on Broadway, nor the difficulty with which vehicles are extricated and travel resumed. To drive from Union Square to Wall street requires no little skill on the part of the driver at all times, and the journey is a series of sinuous and tortuous twistings interspersed with some clever legerdemain by which a vehicle is forced through a passage narrower than its own track. Difficult as travel now is upon Broadway, conceive of what it would be were a surface tramway to be operated thereon. The presence of the rails themselves would be a most vexatious hindrance to travel, and the clever twisting and dodging which Broadway drivers are now enabled to practice through long experience would be rendered difficult if not impossible. The appearance of tram-cars would increase this difficulty to a wonderful extent and render Broadway well-nigh impassable. The solid and heavy car would be confined to its rails and in event of a blockade would be denied all lateral movement. No advantage could be taken of clear spots as is now the case with ordinary vehicles, and each succeeding car approaching in either direction would add to the confusion and involve the thoroughfare in an inextricable jam for many streets from the point of blockade. We are not aware of the speed contemplated by the Broadway surface road, but we should think a passenger very lucky if he could accomplish the journey from Fourteenth street to the Battery in a whole morning or afternoon. Just what interest the advocates of "rapid transit" can take in the proposed road we fail to see, for there is certainly no connection of ideas suggested, and the surface road would probably take preëminence as the slowest tramway in existence."

I do not find fault with most of the statements contained in the above lines, but rather with the deductions drawn therefrom. I maintain that this impossibility of lateral motion which the writer claims would be possessed by tram-cars is in fact a positive benefit to the speedy resumption of travel in case of a blockade, and at all times a powerful agent in guiding this travel and averting blockades. Even the rails themselves, instead of being a hindrance would be a further source of travel-guidance. The cars, being confined to the track, must of course proceed in a straight line, but this rectitude of direction would have a great effect in compelling other vehicles likewise to adhere to a straight course, and the practise now common of drivers endeavoring to "cut ahead" of other vehicles would to a great extent be rendered impossible. Naturally and insensibly the bulk of travel would follow the line of rails, and thus the up and down streams would keep in separate channels as far as possible. I also think it fair to presume that other vehicles than the cars themselves would occupy the tracks, and the relief thus obtained would be great. Blockades are created in one of two ways; either by lateral or back pressure—by too great a number of vehicles moving in the same direction, or by two separate streams of vehicle-travel moving in opposite directions—and Broadway is frequently blockaded from both of these causes. In either event the blockade is generally brought about and maintained by the endeavor of drivers to gain an advantage by passing other vehicles bound in the same direction, thus opposing their own vehicles across the direct lines of travel in both directions. It seems to me that the advent of surface roads upon crowded thoroughfares would, instead of proving a further obstacle of travel, tend to diminish the number of blockades, by marking out the channels of travel and maintaining them. And in event of a blockade the presence of the street-cars would also do much to clear it. The line of blocked cars once put in motion would straighten the line of travel and compel the drivers of free vehicles—those not confined to rails—to adhere to the beaten track.

It must be remembered that I am not speaking of Broadway in particular, but of crowded thoroughfares in general, when I claim that the presence of a surface road is an aid to uninterrupted traffic. In the case of Broadway there are other considerations to be discussed, and it is quite possible that the presence of a surface road thereon may not be desirable; but I think that the interruption of travel is not a valid reason for the opposition that has been manifested. Whether the JOURNAL is convinced or not of the soundness of the above argument I cannot tell, but the discussion is an interesting one, and it should be pushed by the street-railway men. Doubtless a good argument could be made on the other side, and it is very likely that few at first thought, would grant the truth of the proposition that surface roads are traffic-guides, but that such is the case seems to have received frequent demonstration. Those streets in populous cities occupied by surface roads seem, as a rule, to be less subjected to blockades than those where vehicle-travel is allowed free sway.

Final Arrangements for the Convention.

THE Third Annual Convention of the American Street-Railway Association will meet in Parlor D. R. of the Fifth Avenue Hotel, New York City, on Wednesday morning, October 15th, at 10 o'clock. The Executive Committee will meet one hour previous to consider such matters as may be brought before them.

The Association will hold its sessions on Wednesday, Thursday and Friday mornings, and the afternoons will be devoted to brief trips and excursions to points of interest and to sight-seeing generally. The Committee of Entertainment have not fully arranged their programme, but it is thought that a trip to Coney Island will be one feature of the afternoon trips. On the evening of Friday, October 17th, the annual banquet of the Association will be held at Delmonico's.

Secretary Richardson declares the outlook very promising for a large and influential gathering of prominent street-railway men and expects as a result of the Convention a notable increase of membership in the Association.

An extended summary of the proceedings of the Convention will be given in the November JOURNAL.

A New Cable System.

AMONG the recent plans for tramways submitted to the New York Board of Aldermen was a novel system of cable traction controlled by patents by the United States Cable Road and Subway Company. The peculiar feature of this new system is that the wheels of the cars are to be run underground, so that only the body of the car will appear above the street. The difference between this system and the ordinary cable systems in operation in this country is that there will be no tracks to break the surface

of the streets. The tracks are laid in tunnels under the pavement, and the wheels running under them are connected with the car above by a steel plate, half-an-inch thick, which moves along through a slot in the roadway. Mr. Nelson B. Adams, one of the inventors, says: "If this system were introduced on Broadway the street would not be altered in appearance in the least, except that a close inspection would reveal two parallel slots half-an-inch wide, running through it. Under the present system in this city the tracks spoil the streets and do immense injury to all kinds of traffic and ruin them for pleasure driving. Under our system tracks can be placed on Fifth avenue without injuring it as a drive. The bottom of the cars will move along close to the ground—only four inches above the surface—and there will be no climbing in or out, and no one can be run over or seriously injured. We propose—at any time or place, when or where it seems desirable—to build archways between the tracks underground and run trains by electric or other wires or cables there."

The Broadway Surface Railroad.

THE second temporary injunction granted in behalf of the tax-payers against the New York Board of Aldermen, restraining them from permitting the construction of the contemplated Broadway Surface Railroad has been dissolved. It is now thought that the company will apply for a new franchise, since a new petition has been submitted to the Aldermen. The construction of the road under the old franchise is considered very doubtful in any event.

Tramways in Rio Janeiro.

THE Brazilian capital is particularly rich in tramways, there being no less than 133¾ miles within the city and suburbs. The four largest of these tramways are the Botanic Gardens, 22½ miles; the St. Christo, 27½ miles; the Villa Isabel, 17 miles; and the Urbain, 28½ miles. Altogether the 133¾ miles of tramway existing in Rio Janeiro and the neighborhood are owned by nine companies. The rolling-stock placed by these companies upon the lines, comprises 554 carriages, of which 363 are used for the conveyance of passengers, and 191 for the carriage of goods. The traction service is carried on by mules and horses, and there are no less than 4,921 of these animals at work upon the lines. The working staff comprises 1,482 persons. The number of passengers conveyed over the lines has averaged 35,532,926 per annum. The net profits realized upon the four principal lines last year were as follows: Botanic Gardens, £63,024; St. Christo, £62,-165; Villa Isabel, £17,516; and Urbain, £43,666. Two of the smaller tramways were worked at a slight loss last year.

The Elevated Railway between Minneapolis and St. Paul.

SURVEYORS have started on the work of fixing the line for the elevated railway between Minneapolis and St. Paul. The line will run from Division street in Minneapolis past Lake Como, and its terminus in St. Paul will be Arundel street. The company embraces some of the heaviest capitalists in the two cities, and by its articles of incorporation the capital stock is to be $3,000,000. It is proposed to run trains between the two cities every fifteen minutes, and the fare each way will be five cents. It is thought that the distance can be made in twenty minutes. The roadbed is to be sixteen feet above the ground, to give ample room for teams below. The bed of the double track will be closely planked, and a four-foot screen will be placed outside the track so that teams may not be frightened at the sight of the engine. The most approved pattern of coaches will be used, and automatic wire gates will be used at the stations which will be located every four blocks within the city limits, and on the intermediate territory as thickly as may be found desirable.

TRAMWAY NOTES.

THE work of constructing the cable line in Philadelphia upon Ninth street by the Philadelphia Traction Company has been impeded by an injunction, obtained by the Ridge Avenue Passenger Railway Company. It is probable that the matter will be amicably adjusted. The company is about to build two additional lines of road, one of which will begin at Twentieth and Wharton streets, go North to Chestnut street, thence to Front, to Walnut, out Walnut to Nineteenth, and thence down to Wharton street. The other line will start at Forty-second and Spruce streets, run to Woodland avenue, thence to Market street, down Market to Front, returning on the same route.

THE Lexington avenue and Fourteenth street Railroad Company, of this city, with a capital of $1,000,000, has been incorporated. It is proposed to run the road through Lexington avenue from Ninety-seventh street to Twenty-third street, which it is to traverse to Fourth avenue, thence to Fourteenth street, where it is to terminate. It is to be double-tracked. As soon as Lexington avenue is opened to the Harlem River the road will be continued Northward. The trustees are John Downey, George W. Lynch, Charles Curtis, Lewis May, George W. Conner, Isaac Hendrix, and Thomas Rogers. It is to be a horse road.

SOME citizens of Kansas City, Mo., have obtained an injunction against the further construction of the cable road in that place. They claim that the streets through which the road is now being built are so narrow as to make it impossible to leave the distance between the rails and the sidewalk that the ordinance requires. The road is about half completed, and it is not believed that the action of the property-holders will prevent its final construction.

A COMPANY has been incorporated in New York State, for the purpose of building and operating a street surface railway from Bartow Station, on the New York, New Haven and Hartford Railroad, to City Island. The line will be a little more than three miles long, and will run nearly the entire length of City Island.

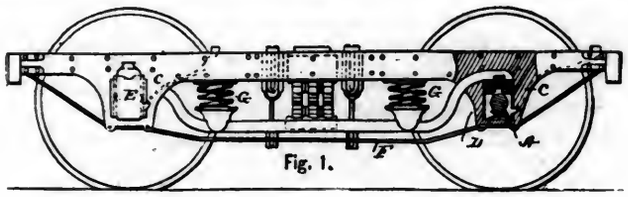
THE St. Louis (Mo.) Cable and Western Railroad has been incorporated. Besides building a cable road in the city, the company propose to buy the St. Louis, Creve Cœur Lake and St. Charles Railway.

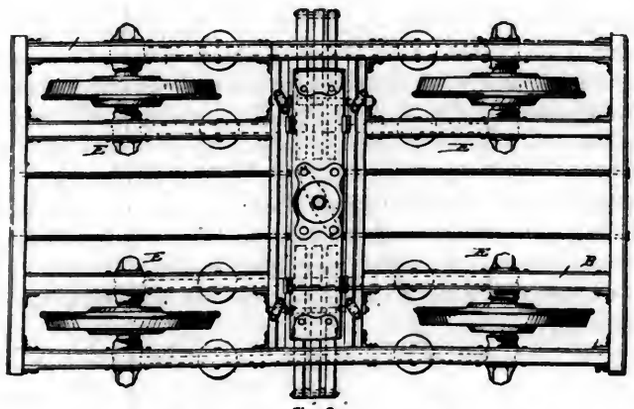
THE Moline Central Street-Railway Company, of Moline, Ill., has been incorporated, with a capital stock of $12,000.

New Inventions.

Roberts's Divided Axle Car-truck.

THOMAS H. ROBERTS, of Wilmington, Del., has patented an invention relating to improvements in the construction of car-trucks. It is chiefly conspicuous for a divided axle, and is especially designed to provide for the easy running of railway and tram-cars around sharp curves. The difficulty with the ordinary car-truck lies in the fact that the inner and outer wheels are upon the same axle, and thus in turning a curve the outer wheel is guided by a larger radius, which causes a grinding and slipping of the wheels and a consequent wear of rails and tires, attended by a retardation of speed and a loss of power. The present device is intended to overcome these difficulties which is accomplished by dividing the axles and turning the inner portions of the divided axles to form journals exactly corresponding with the outer journals.





ROBERTS'S DIVIDED AXLE CAR-TRUCK.

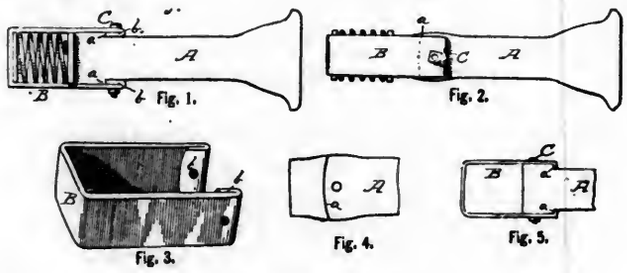
The accompanying cuts illustrate the device and its operations. Figure 1 is a side elevation of a car-truck embodying the improvements of the invention. Fig. 2 is a plan view, and Fig. 3 an end elevation.

The longitudinal bars B are arranged, as shown, to carry the pedestals C, which correspond with those now in use on the sides D. Extra boxes E, equalizing-bars F, and coiled springs G are used. The entire arrangement of the truck is such that the same pattern of axle-boxes, brasses, equalizing-bars, pedestals, and coiled springs now in use can be used thereon. The inner boxes E, are fed with oil through a small tube leading from an oil receptacle or receiver H, which conveys the oil direct to these boxes from the outside, avoiding the necessity of getting under the truck.

By the construction above described each wheel works separately and independently of the others, and in traveling around curves allows the outer wheels to travel faster, as the greater radius of the outside of the curve demands, thus saving the grinding and slipping of the inner wheels, and the consequent wear of the rails and tires, and avoiding a retardation of speed, together with a loss of power.

Morris's Stirrup-strap.

ROBERT MORRIS, of La Crosse, Wis., is the inventor of a device relating to that part of a car-coupler known as the "stirrup," and to the means for and the manner of securing it to the draw-bar. The accompanying cuts illustrate the device which the inventor denominates a "stirrup-strap."



MORRIS'S STIRRUP-STRAP.

Figure 1 is a side elevation of a draw-bar, showing the improved stirrup as applied; Fig. 2 is a plan view of the same; Fig. 3 is a perspective view of the stirrup-strap; Fig. 4 is a detail view showing the end of the draw-bar to which the stirrup-strap is attached, and Fig. 5 shows the construction of the common draw-bar and stirrup now in use. The reference-lettering is similar throughout the figures.

A represents a draw-bar and head of the usual construction, having the vertical dimensions of the end made greater, so as to form shoulders *a a* on the upper and under surfaces, against which the ends of the stirrup-strap B bear when in position, so as to form a greater resistance to the strain to which the stirrup is subjected when in use.

In the old form of freight-car draw-bars in current use, and as shown in Fig. 5, the shoulders *a a* are at right angles with the upper and lower surfaces, and extend laterally in a straight line from side to side; and the strap B has its ends bent at right angles to the longitudinal arms of the stirrup to lap over the shoulders *a a*, and a bolt C, properly secured by a nut, passes through the strap and through the increased vertical dimensions of the contiguous end of the draw-bar, as shown. When it is considered what a great strain the stirrup is subjected to, it will be obvious that most of the strain must be borne by that portion of the bolt C passing through the strap. The bolt will therefore, when in constant use or subjected to a great strain, be cut or broken off, thus throwing all the strain on the ends of the stirrup, which, not being able to stand it, are pulled off the draw-bar. In order to avoid these objections the ends of the strap B are doubled or bent back upon its length to form hooks *b b*, the ends of which bear against the shoulders *a a*. The strap is then secured in position by passing a bolt C, laterally through the two thicknesses of the strap made by the hook, and

through the contiguous vertical portion of the bar A, thus giving that portion of the bolt passing through the strap a greater resisting surface than can be had by the common stirrup and draw-bar, and relieving considerable of the strain from the same by having the ends of the strap bear against the shoulders *a a*.

If desired, the shoulders *a a* may be inversely beveled, as shown in the drawings, and the ends of the straps beveled the reverse of that of the shoulders. This construction would help resist the tendency of the straps to slip off the shoulders. As there is usually a slight oscillation of the draw-bars, especially when the cars to which they are attached are turning curves, the shoulders *a a* are given a slight inverse curve transversely from side to side of the bar, and the extremities of the hooks are curved obversely to the shoulders. This construction permits such oscillation without injury to the bolt C. In the draw-bars of the Miller coupler, where there is considerable oscillation, this stirrup-strap may be employed to great advantage. In order to give additional strength to that part of the draw-bar through which the bolt passes, the vertical sides thereof adjacent to the bolt, are bulged or curved outward, thus increasing the lateral dimensions at that point.

While the shoulders *a a* are preferably inversely beveled and curved transversely, and have a corresponding conformation of the extremities of the hooked part of the stirrup-strap, yet such construction is not absolutely necessary, for the improved stirrup having the hooked ends can be used with the common form of draw-bar to great advantage by placing the bolt C through the hooked ends, instead of through the length of the stirrup.

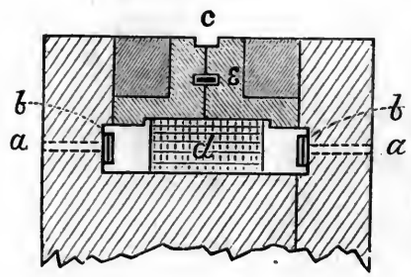


FIG. 1.

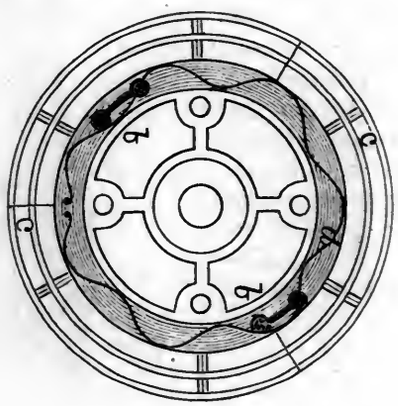


FIG. 2.

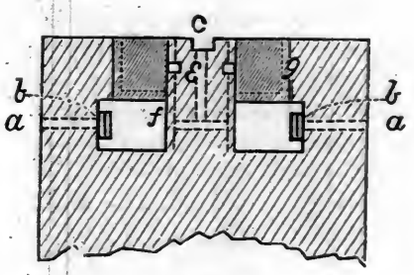


FIG. 3.

SUCKOW'S PISTON-PACKING.

Suckow's Piston-packing.

EDMUND SUCKOW, of Buffalo, N. Y., is the inventor of a new method of piston-packing, the object of which is to provide a means for keeping a tight, close, sensitive and self-adjusting joint between the piston and the cylinder by the action of the steam, and to act also as a lubricant as the piston moves in the cylinder.

The accompanying cuts illustrate the device and its operation. Fig. 1 shows a part section of the piston, cutting through the rings, spring-valves, etc. Fig. 2 is a face view of the piston, the follower being left off so as to expose the center face of rings at C, one-half of the rings being left off; it shows also the inlet spring-valves and wave-line spring or springs. Fig. 3 shows a part section of a so-called solid piston, or where a bull-ring with follower is used, but as altered to this invention. The reference lettering is similar throughout the illustrations.

The body of the piston is of the usual form; *a* represents the small holes or openings leading to the flat spring-valves *b*, which have some softer metal added to a part of the seat, if desired, and are secured in a recess or groove, covering the holes inside the face of the piston and follower underneath the rings. The inside of the rings correspond to the inside edge of the recess so as to form no shoulder by wear, and the arrangement is such that the steam or fluid has a free inlet into the piston, but has no outlet, so that when the steam enters the piston it is retained there, and passing through the openings between the center part of the rings (Fig. 2) or face-side of the bull-ring (Fig. 3) into the circular space *c*, it will act as a central lubricant and prevent any undue pressure within the piston against the inside of the cylinder as well as against the face of the piston and follower. At *d* is shown the position of the wave-line spring or springs. In Fig. 3 the dotted lines at *f* and *c* show the communication between the steam-chambers on each side of the bull-ring and lubricating space *c*. At E is a recess where a light wave-line spring may be inserted to insure always a close joint in starting an engine when the rings are worn. The dotted lines at *g* (Fig. 3) show a so-called shoe or angle-plate on the side of the ring facing the piston and follower where the single rings are cut in one or more places. It is claimed by the inventor that in the use of his device the cutting of the bore in the cylinder by the uneven setting-out of springs with spring-bolts, etc., and the loss of power by too great friction as well as the loss of steam or fluid through slackness of the rings, etc., all of which defects are common in methods hitherto employed, can readily be obviated.

De Witt's Car-check.

JAMES M. DE WITT, of Grand Junction, Colo., has lately invented and patented a railway car-check, designed to prevent the accidental movement of standing cars on railway tracks. It consists of a check-block for railway

tracks, the grooved and recessed block combined with the staple-like rod passing through and embracing the sides thereof, and having the hook ends to engage with the ties or track structure. The check-block consists of an iron shoe made so as to fit over and rest on the rail having a strong iron rod through it, which runs along both sides, and having the ends bent so as to form dogs to catch against the ties when there is any pressure against it. These dogs will prevent the shoe from slipping when the wheel of the car strikes it.

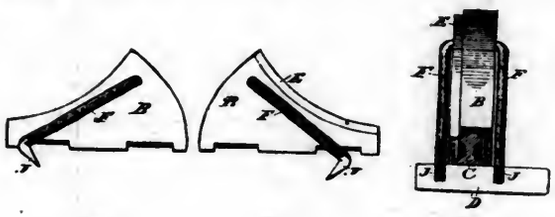


FIG. 1. FIG. 2. FIG. 3.

DE WITT'S CAR-CHECK.

The construction and operation of the device are very simple and can be fully understood by reference to the accompanying cuts. Fig. 1 represents the outer side of the check or shoe B. Fig. 2 represents the reverse side of the check or shoe B, showing the space E left for the flange of the car-wheel to pass over, which space is on a line with the inner side of the rail C, as shown in Fig.-3. Fig. 3 represents an end view, showing the manner of the check or shoe setting on the rail; also the rods F F on both sides of and through the check or shoe. J J represent the hook ends of the rod, catching upon the ties.

Meredith's Safety Coupler.

FENTON A. MEREDITH, of Hagerstown, Md., has recently devised and patented a safety car-coupler, the objects of which are to raise the link in coupling to prevent its being broken, and to accomplish this result without danger to the person performing the operation. The accompanying cuts illustrate the device and the manner of operating it. Fig. 1 is a side elevation of the coupler attached to the draw-head, and Fig. 2 a detail view of the lever and fork for raising the link.

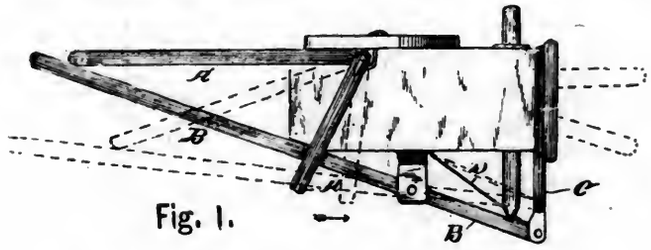


Fig. 1.

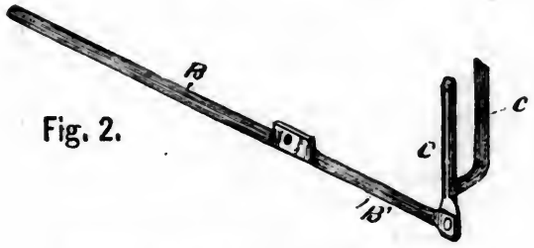


Fig. 2.

MEREDITH'S SAFETY COUPLER.

To operate the device, the lever-handle A is thrown forward in the direction of the arrow, and the lever-arm A′ downward, forcing the lever-arm B down and the lever-arm B′ up, bearing the fork C, the prongs of which catch the link and raise it to a horizontal position, as shown by dotted lines in Fig. 1. When the coupling is completed, the lever B is forced down by the spring D, carrying the fork C down and allowing the link free play.

The device can be applied to any ordinary draw-head at a trifling expense.

Hoover's Improved Car-wheel.

WILLIAM HOOVER, of Salt River, Mich., has devised and patented a car-wheel which is herewith illustrated and described. In the accompanying diagrams, Fig. 1 represents a central vertical section of the wheel, and Fig. 2 a detail view of one of the sectional blocks employed in the construction of the wheel.

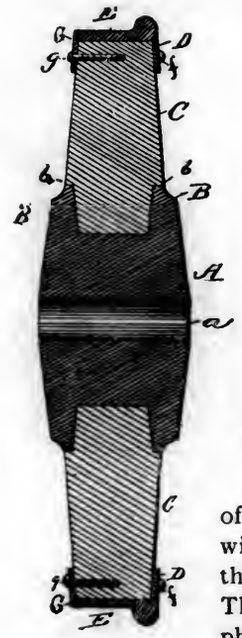


Fig. 1.

HOOVER'S IMPROVED CAR-WHEEL.

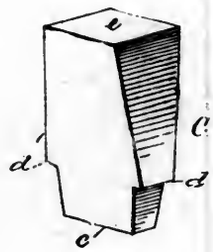


Fig. 2.

HOOVER'S IMPROVED CAR-WHEEL.

In Fig. 1, A represents the hub of the wheel, which is provided with a central perforation *a*, for the passage of the axle-spindle. This hub A, is also provided peripherally with two flanges, B, which are so arranged relatively to each other as to form between them an annular depression which contracts gradually from the top toward the bottom. Each flange B is flattened at the top to present an annular shoulder or seat *b*. A series of blocks or wood sections C (Fig. 2), are decreased toward the bottom, and are cut away at their lower portion to form a tongue *c*, and shoulders or offsets *d*. The upper face *e*, of each block is curved, as shown in Fig. 2. The blocks C are arranged in the wheel, as shown clearly in Fig. 1, so that the tongues *c* rest in the contracted depression between the flanges B, while the offsets *d* of the blocks rest on the annular seats *b*, afforded by the top of the flanges B. The width and proportion of the numerous blocks are such that they fit snugly in position and constitute a practical body for the wheel. A ring or band D, rests against the inner faces of the blocks C, near the periphery of the same, and retains them in position on the inner side of the wheel by means of bolts or other fastening devices, which pierce the ring D and engage the blocks at intervals. The tread E of the wheel has the usual flange at the inner side of its periphery, and is further provided with a depending flange G, which bears against the outer sides of

the blocks C, and retains them in position at the front by means of bolts *g*, which engage blocks alternating with those in which bolts *f* enter from the inner side of the wheel as shown in Fig. 1.

From the foregoing it will be seen that a wheel thus constructed is cheap as well as durable, and that the several parts composing the same may be readily put together in forming the wheel. The contracted depression permits the tongues *c* to be snugly placed between the flanges B, while the provision of the annular seats *b* resists radial strain from the tread toward the hub. By arranging the tread E and band D as described, the tread is secured at the outer side of the wheel, the inward pressure on the flange by the rail being sufficient to hold the tread in position. By removing the bolts *g* of the tread, the blocks C not engaged by the bolts *f* may be readily withdrawn, or tightened by the insertion of additional blocks.

Harlow's Valve-gear for Direct-acting Steam-pumps.

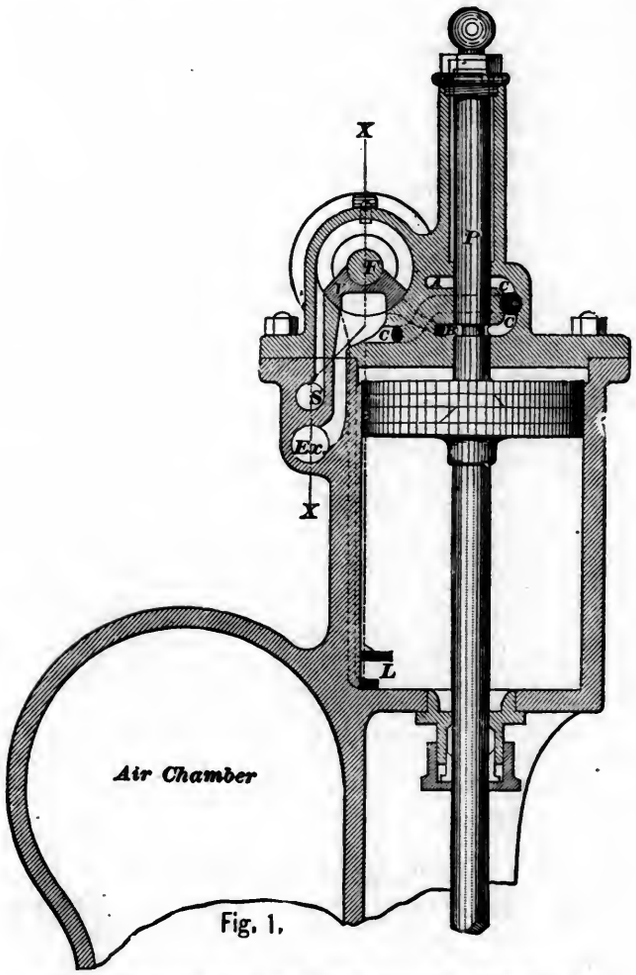


Fig. 1.

HARLOW'S VALVE-GEAR FOR DIRECT-ACTING STEAM-PUMPS.

MELLEN S. HARLOW, of Hoboken, N. J., has invented a valve-gear for direct-acting steam-pumps which is herewith illustrated and described. Fig. 1 represents the complete mechanism, and Fig. 2 represents a section through it. The same letters of reference designate corresponding parts in either figure. S is the main supply to the steam-chest. Ex. the exhaust. L the port to the lower end of the cylinder, and U that to the top. The valve-gear consists of three parts, viz.: the auxiliary valve P, attached to the main piston-rod and moving with it, the auxiliary piston F, and the main valve V, moved by the auxiliary piston. Its operation is readily understood: As represented, the main piston has reached the end of its upward stroke, and the auxiliary-valve P, has opened the ports B and C, exhausting the steam from the end of the auxiliary-piston. Steam enters the other end through the port D, and moves the main valve to the other side. When the main valve is open for the downward stroke the auxiliary ports B and D are covered by the auxiliary-piston, the main valve remaining in its position. When the main piston reaches the lower end of the cylinder the end of the auxiliary-valve P, has passed below the ports A and C, and the auxiliary-piston is moved with the main valve to the other end of its stroke, as previously described, by steam entering through D'.

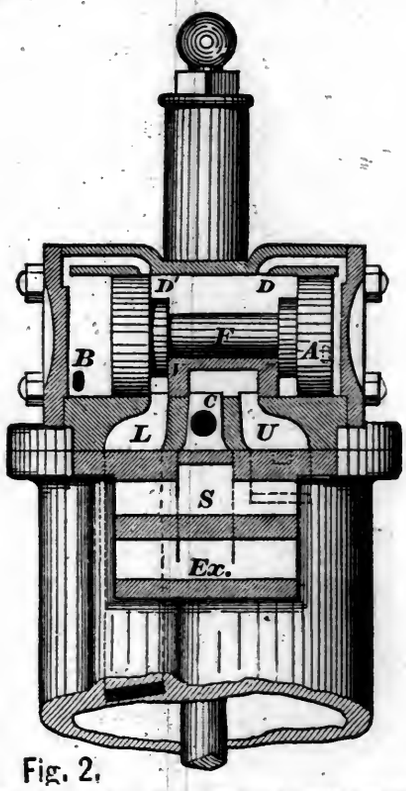


Fig. 2.

HARLOW'S VALVE-GEAR FOR DIRECT-ACTING STEAM-PUMPS.

It will be seen that the movement of the main valve is accomplished without the use of either tappets, links, levers or cams of any kind, and the motion is substantially positive. The auxiliary-piston is steam-cushioned to avoid striking the heads, and this also accomplishes another purpose, *i. e.*, if the auxiliary-piston is moved too far, so as to partially cover the main steam ports, the cushion-pressure returns it so as to leave the ports fully open. The main steam ports, when they enter the cylinder, are divided so that when the main piston nears the end of its stroke the supply of steam is diminished. Similarly the full supply of steam is not admitted until after the piston has traveled a short distance on its return stroke. This provides for a slow motion at the beginning and end of the stroke (approximating the motion from a crank and fly-wheel), avoids striking the heads with the piston, and gives the valves time to seat quietly and without shock. This, with the valve motion as described above, makes a steam-pump practically noiseless at any speed. This valve-gear is especially applicable to locomotive and tank pumps, and also to the air-brake pumps in use on our railways.

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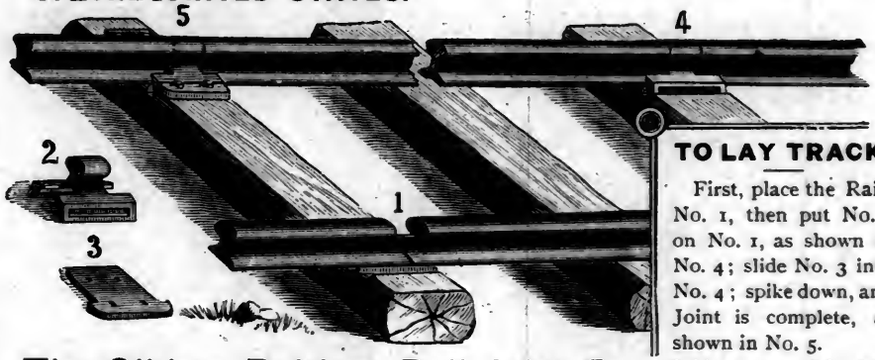
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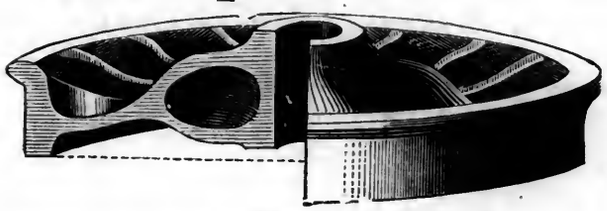
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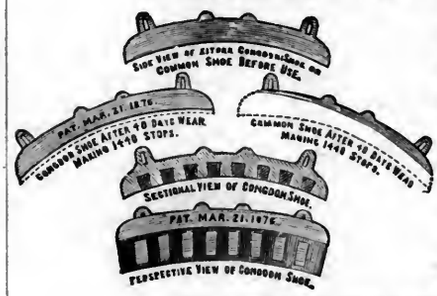
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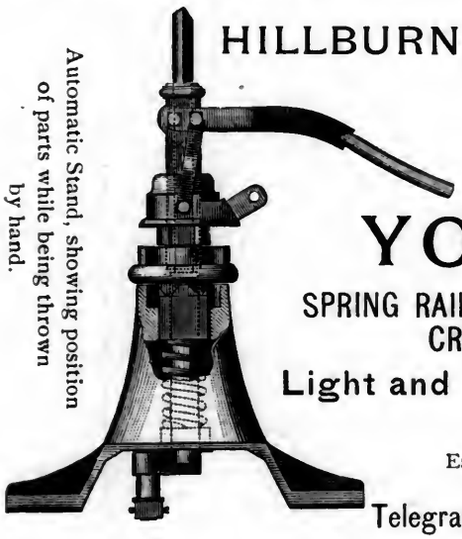


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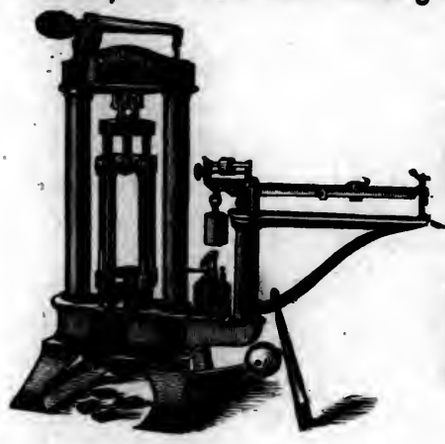
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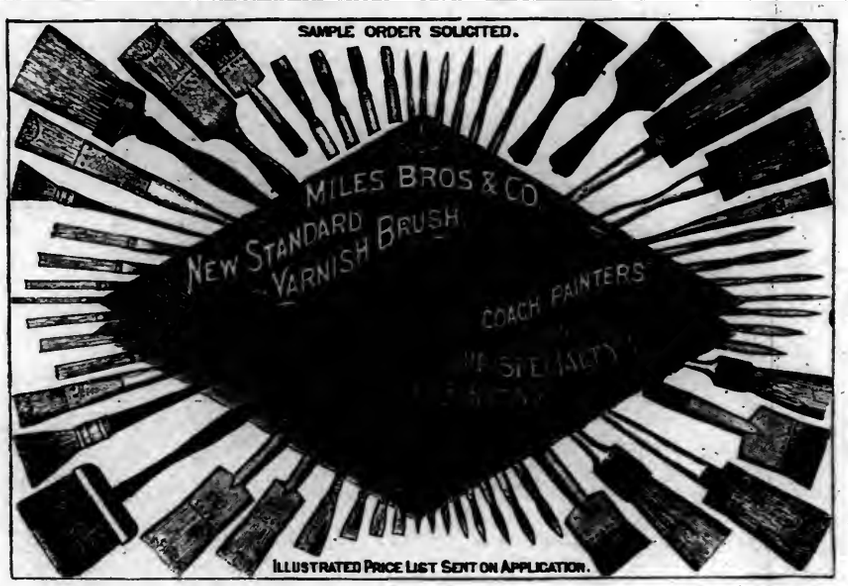
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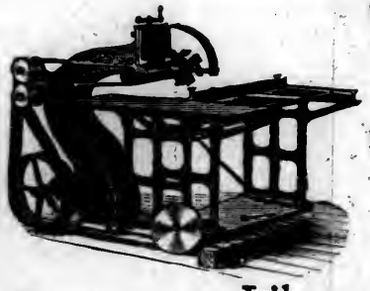


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WHOLE NO. 2,558.] NEW YORK, NOVEMBER, 1884. [VOLUME LVIII.—No. 8.

A FEW PERTINENT AND IMPERTINENT SUGGESTIONS IN BEHALF OF THE COMMUTER.

BY AN OLD RAILROADER.

[Written for the AMERICAN RAILROAD JOURNAL.]

SEEK not, dear reader, to penetrate the gloomy mystery appertaining to the authorship of this brief contribution, nor attribute sinister motives to the writer if his "suggestions" have a smack of sarcastic truth. The animus which prompts this screed is simply and solely a desire to improve the methods of travel and to cater to the traveling public in such a manner that a life upon the rail will seem an Olympian existence contrasted with the humdrumishness of every day life.

Traveling is the greatest pleasure one may enjoy, if the conditions are favorable for enjoyment. It is also the most miserable of occupations if the conditions are favorable for misery. Nor are these conditions clear and well-defined, for it is a brief step between those of the first and last-named classes. Traveling, I take it, is like shaving. If the tonsorial artist *is* an artist, and if his razors are well honed and his chair comfortable, a shave is a great luxury. If, per contra, he be a bungling apprentice, with razors keen as a hoe, and a chair like a rail-fence, a shave under these conditions is a lamentable and tearful penance. So, in the language of Marc Antony, let it be with traveling. If railways run their trains with promptness and dispatch, if their cars are well-lighted and heated, if they be clean and comfortable, and if the train service be ample and accommodating, then, traveling is a luxury. But if this pleasing picture is reversed, and instead, the vista opens of lagging trains, dirty and uncomfortable cars, and a surly set of train-hands, farewell to aught but misery, and in the latter you will find a close and inseparable companion.

America is a nation of travelers, and it is doubtful if the citizens thereof quite appreciate the dignity of travel to which they have arisen. Without departing from the confines of a single county many of our countrymen have outdone in actual distance traveled, the wanderings of the tourist sybarite. Take that peculiarly American class of travelers, the "commuters." The commuting passenger travels to and from his place of business, daily, a distance either way varying from five to twenty-five miles, and not infrequently still further. Let us assume that the average commuter travels daily in either direction, a distance of ten miles, or a total of twenty miles daily. This is certainly a moderate estimate, and on this basis I venture to assert that the average commuter of thirty years' standing is a wonderfully traveled individual, before whom Marco Polo and Dr. Livingstone sink into insignificance. Twenty miles per day for six days in the week, is one hundred and twenty miles per week; for fifty-two weeks it becomes six thousand two hundred and forty miles per year, or making allowance for holidays and vacations, a round six thousand miles! This pursued for thirty years, the quiet, unassuming commuter can lay claim to one hundred and eighty thousand miles of travel! Now this is quite a distance. It is almost equal to eight times the circumference of the earth and considerably more than one-half the distance to the moon, and mark you, this distance has been traveled inappreciably. I know of one old gentleman who for nearly fifty years has traveled daily between New York City and his suburban, or rather country home, forty miles away. I calculated that in his simple daily journeys between home and business he has traveled in all, over a million miles! When I told the gentleman that he had traveled twice to the moon and back, and a couple of times around the world he scarcely grasped the idea, and yet cold figures demonstrated that his peregrinations had in sober truth amounted to an equivalent distance. To accomplish this undertaking he had paid an average monthly sum of fifteen dollars—it was considerably more in the early days of railway travel but I take the lowest figures—or one hundred and eighty dollars a year, and in all he has paid into the treasury of the particular road he patronized, the snug little sum of nine thousand dollars.

Now I claim that this class of traveler deserves consideration, and the railways would do well to heed his wishes. Without doubt, many commuters live at points distant from their business through motives of economy, preferring a comfortable home in the suburbs at a moderate rental to the cramped quarters offered in a city residence to men of small means, but that sum of nine thousand dollars expended in railway travel might stagger a great many upon mature deliberation, and the conclusion might be reached that a home in the city would, after all, be the cheapest in the long run. It is for the interest of railways that this conclusion should not be reached, and it may be avoided by rendering the daily hours of travel a period of luxury. To this end I would offer a few suggestions; some pertinent and a few possibly impertinent according to the caption of my communication.

To begin with, the commuter invariably seizes his hours of travel for the perusal of the daily papers. It follows that this occupation should be rendered as comfortable as possible. The cars should be furnished with buoyant springs and jolting avoided, for the constant vibration and oscillation of the cars is ruinous to the eyesight and detrimental to comfort. For similar reasons the light furnished, especially in the short Winter evenings, should be bright and steady, without glare, and the dismal lamp should be suppressed in favor of gas or the incandescent electric light. Again, the commuter is generally a smoker. There is something about railway travel that is associated with tobacco, and the morning and evening whiffs are indispensable luxuries to the commuter. No one, I think, will dispute this fact, yet those trains run with special

reference to the requirements of the commuting public are furnished with but one smoking-car, which is generally filled before the remaining cars are half occupied. There would be little difficulty in furnishing two or even three smoking-cars to every train of this class, and I doubt not that railway superintendents will do so immediately upon reading this article. They are a well-meaning class of individuals, and by no means the ogres they are generally painted. They are also get-at-able without prostrating one's self upon the ground and crying aloud to Allah in the oriental fashion, despite popular opinion to the contrary. Speaking of smoking causes me to wish that the railways could introduce sumptuary laws regarding the quality of tobacco used by their patrons, but this I fear is impracticable. At any rate the introduction of the diabolical cubeb cigarette should be rigorously suppressed. Of all pests to the smoking traveler this is the greatest, and the most senseless. Not long since I was seated next to a youth in a smoking-car and he was consuming one of these death-dealing cigarettes under my very nostrils. I stood it as long as I could, but finally in sheer self-defence asked him to desist in his reckless career, and offered him a choice Havana in the way of a bribe. He responded that he had the catarrh and used cubeb cigarettes as a curative. "This is no hospital! my young friend," was my stern rebuke, and I basked in the admiration of the other passengers for my timely remark. . The youth was silenced—but he went on smoking his cubebs.

While on the subject of smoking I would offer another suggestion, to the effect that railways should have smoking-cars of three grades, viz.: for five, ten and fifteen cent and upward cigars, and pipe and cigarette smokers should be relegated to the first grade. This is worthy of attention, and the companies should at once consider the question of appointing inspectors who shall examine the smoking materials of each passenger before admitting him to the cars. Jesting aside, while it is impossible for railways to do away with bad tobacco on their smoking-cars, they can at least prevent this annoyance from being caused by their own employés. On many roads the practice is common of picking up a gang of trackmen at points along the line and herding them in the solitary smoking-car of the train, where, with garments covered with dirt, and in a generally unpleasant condition, they puff their "carpet tobacco" in the faces of the regular passengers. In fact the smoking-car is considered to be the police station of the train, and thieves on their way to the penitentiary, and tipsy men reeking with the fumes of stale whiskey, are consigned to it, on the principle that a smoker can stand anything. Dogs, it is true, are consigned to the baggage compartment, but I would sooner have a dog as my companion than a tipsy man, for he is a more rational being, and a great deal better company.

To depart from this redolent subject, I would mention two classes of travelers who merit instant suppression. First the fresh-air fiend, who persists in keeping his window open in the depths of Winter, and his equally familiar antithesis, the anti-fresh-air fiend, who persists in keeping it down in the sweltering days of Summer. I would recommend that there be a universal attachment in all passenger-cars, by which the windows may be closed in Winter, and opened in Summer, and that the passengers be unable to interfere with the operation of the device. The two fiends would then subside, or die, which is still better. Cars could be ventilated without the admission of cold, wintry air, and their non-ventilation is owing to the poor methods of heating generally in vogue. The stove at one or each end of the car is a clumsy arrangement, which either renders the ends or the middle the only comfortable portions of the car. When the ends of the car are comfortable, the middle is too cold, and when the middle is comfortable the ends are too hot. From the nature of the case this will always be so where stoves are employed, and it would seem advisable to place the heating apparatus on the outside of the car, or employ a system of steam heating, drawing a supply of steam from the locomotive.

Am I through? By no means, and yet I shall close. I have been speaking in behalf of the commuter, the humble, unassuming individual who pays his thousands of dollars into the coffers of a railway, but makes no sign, and to whom we must look for the building up of suburban towns and villages. He is a silent power, but he is a power, and his wishes should be respected to a greater extent than they are at present; but in my anxiety to aid his cause I do not wish to overdo the matter. The "suggestions" I have offered are in relation to the unconsidered trifles of railway travel, but they are trifles met with every day in the week, every week in the year, and every year in a business life, and their proper treatment would assure a greatly increased luxury to the commuter. There are other trifles that I might adduce, but I think I will wait until I see what will be accomplished in the reforms I have already suggested, before I refer to others. Railways are big things to handle, and we should be content if their managers make haste slowly.

PROGRESS IN SOUTHERN TRAVELING FACILITIES.

BY WILLIAM S. VEST.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN a late number of the JOURNAL, some account was given of the fatigue, discomforts and delays always attending a journey from New York to Florida in the early days of railway existence in the South, when travelers were compelled to undergo the nine miles of dreary staging from Potomac Creek to Fredericksburg, and for some years later the uncomfortable voyage by sea of over one hundred and fifty miles from Wilmington, N. C., to Charleston, S. C.

During the ten or fifteen years preceding the war of secession, all of the railways in the South had greatly improved their condition; many of them had been entirely rebuilt, with iron rails substituted for the wooden abortions of that name, once universally in use. The locomotives and rolling-stock were in far better order. Not a few were paying good dividends, and new lines were being constructed in every State south of the Potomac. But the breaking out of the war, like a patent air-brake, put a stop to this prosperous state of affairs very suddenly. After four years of hard work for the Confederate government, with very unsatisfactory pay, the roads found themselves either ruined financially or so crippled that many had to go into the *dernier resort* of the miserable—the hands of a Receiver; but as this article is confined to a description of the direct route from New York to Florida, it will allude only to those railways included in it.

Great as has been the improvement between New York and Washington to the traveler in point of speed and comfort during the past forty years, it is but trifling when compared with that made in the same period, south of the latter city. It was there that the passenger southward-bound truly considered that his discomfort commenced. It is far different now. He can, if he takes a "Pullman," go without change of cars from New York to Florida, and sleep comfortably if he chooses while passing through the pine barrens of the Carolinas and Georgia, and in so short a time that he can dine in New York one day, in North Carolina the next, and on the day following eat his lunch on the banks of the St. Johns River. He leaves New York at 9 P. M., and Washington the following morning at half-past six, by comparatively a new route by rail on the Alexandria and Fredericksburg Railway to Quantico (34 miles), and thence to Richmond (82 miles) on the Richmond, Fredericksburg and Potomac Railway, arriving at what was once the rebel capital in only four and a half hours from Washington; thence to Weldon, on the Richmond and Petersburg Railway (22 miles), and the Petersburg and Weldon (62 miles), arriving in that classic town in time for an early dinner. The latter road suffered greatly during the late war. Severe battles were fought for its possession by the contending armies and it finally remained in the hands of the Federal troops, who completely destroyed more than half of its track, and burned its most important bridges. Its loss to Lee's army was a serious damage to the Confederates, compelling them to receive their supplies from one road only—the Southside Railway—extending to Danville. When this too fell into Gen. Grant's hands by the battle of Five Forks, Petersburg was no longer tenable.

But comparatively few readers of this JOURNAL can form an idea of the short time required by an army to destroy utterly the track of a railway. A division of five or six thousand men by spreading itself along a road could, in a few hours, pry up the rails and cross-ties extending for fifteen or twenty miles. By piling up the latter in heaps a few feet apart and setting fire to them, heat was produced sufficient when the rails were placed on these extempore furnaces to bend and even twist them in such shapes as to render them permanently useless. It was the ill luck of the writer to tramp for many weary miles in the wake of Sherman's army, and he was forced to admire the thorough manner in which the work of railway destruction was completed. Many trees had the rails wrapped around their trunks, the ends twisted over each other in neck-tie fashion; of the cross-ties, nothing but ashes remained.

A singular accident occurred on the Petersburg and Weldon Railway many years ago. In December, 1840, a memorable snow-storm prevailed over the entire North and extended as far south as Weldon, where it was encountered by a large party of United States Senators and Representatives bound to Washington. On the way to Petersburg the train moved so slowly and stopped so frequently from constant slipping, that many of the passengers were able to keep up with it by walking. Among the pedestrians was the well-known Waddy Thompson, of South Carolina, Representative in Congress from the Greenville district. He was walking a few feet in front of the locomotive when, his foot slipping, he fell, and on rising was struck and knocked down by the bumper, and the engine passed over him. When extricated he was found to be uninjured. He had fallen into a cavity caused by the removal of a defective mud-sill, not replaced by a new one; this enabled the truck-frame of the locomotive, extending to within a few inches of the track to pass over without touching him. It was the only mud-sill out of place on the entire line of the railway, and as there were more than a hundred thousand of them, the Hon. gentleman stood about as good a chance of escaping unhurt as the United States now has of possessing an efficient navy.

Trains, now-a-days, fortunately stop but a short time at Weldon, long enough, however, to satisfy every one on board that nothing is lost by a speedy departure from such a dreary looking town. In five hours Wilmington is reached; Goldsborough, on the line of railway is now quite a flourishing place; only three towns in North Carolina exceed it in population, while forty years ago it was a mere hamlet. At Wilmington, the trucks of the cars are changed for those having a gauge of five feet; this takes but a few minutes, and is done without disturbing the passengers.

Here, until a little over thirty years ago, the northern mail and passengers bound south took their leave of railways and trusted to the tender mercies of the sea. About that period, the enterprising citizens of Wilmington thought it high time for them to be connected with railways extending to the South and West. Impressed with this idea, a committee started for Charleston and tried hard to obtain assistance in building a railway, striving for an air line between the two cities. The advantages of the route were eloquently set forth; there would be no right of way to pay for; no cuts or embankments required, the country being a dead level; only a few bridges to cross the Santee and Waccamaw rivers were necessary, and the committee guaranteed to build the road down to the South Carolina line themselves. They met with no aid from Charleston. The citizens of that venerable town could not be induced to take stock in the proposed enterprise, nor would the South Carolina Railroad Company, at that time a wealthy and influential corporation, render any assistance. After days of suspense its answer was that it would be "inimical" to its own interests to furnish or even recommend aid to the new project. Back went the Wilmingtonians to their city of tar and turpentine, indignant but not discouraged. A railway they were determined to have, if not to Charleston to somewhere else; and they lost no time in building one—the Wilmington and Manchester—to Kingsville, on the Columbia branch of the South Carolina Railway. As soon as this road was finished, the steamers stopped running, and for several years the only mail route between Wilmington and Charleston was by the roundabout one from the former city to Kingsville, and thence to Charleston by the South Carolina Railway, a distance of nearly three hundred miles. By this arrangement the wise citizens of Charleston soon found that they were left out in the cold. The great Northern mail train with its numerous passengers passed one hundred miles to the north of them, and went on to Augusta, and a great mistake had evidently been made in refusing aid to build the air line road from Wilmington. Accordingly, the Northeastern Railway was hurried through and completed, tapping the Wilmington and Manchester road at Florence, 102 miles from Charleston.

The passengers, after eating supper in Wilmington, now

reach Florence (112 miles) in three and a half hours, and the Savannah Junction, seven miles from Charleston, a little after 4 A. M. Here they are (those bound to Florida) transferred to the Charleston and Savannah Railway, reaching the latter city in ten and a half hours; average speed from Wilmington (315 miles) 30 miles an hour. In Savannah the "90th meridian" time is encountered and watches are put back an hour to suit it. The Charleston and Savannah Railway was completed a year or two before the war, and when hostilities ceased it was in bad order. Financial embarrassments turned its management necessarily over to the tender mercies of a Receiver, and litigation on a large scale was commenced and carried on in a lively manner for years. To gentlemen of the legal profession this proved to be a mine of wealth; they got the oysters, and the poor stock and bondholders the shells. The track became worse with each succeeding year; it was, except at a low rate of speed, unsafe to travel over, and it was said that on this account the Pullman coaches would be withdrawn. It was finally purchased in the interest of the railways north of it two or three years since, and is now in excellent running order. Steel rails have replaced the worn-out iron, and the trestle work and bridges have been thoroughly repaired. From Savannah the passengers proceed on the Savannah, Florida and Western Railway to its junction with the "Way Cross," a road recently completed, and on it they arrive in Jacksonville, 171 miles from Savannah, at noon; a little more than a day and a half from New York.

The traveler who made his only visit to Florida forty years ago would not now recognize the wilderness he was then so anxious to leave. Towns and villages have grown into existence all over the eastern and middle portions of the State. First-class steamers ply daily on the St. Johns River, and fastidious tourists can find no fault with the luxurious accommodations afforded by the hotels in Jacksonville and other places. Railways already give them rapid transit to localities in the extreme Eastern and Western portions of the Peninsula, and in a few years, no doubt, Cape Sable at its Southern extremity will be reached by the same mode of conveyance. Everything is changed since the days when the euphonious names of the Seminole chieftains were as familiar as household words to most people. "Tiger Tail," "Billy Bowlegs," and "Wild-cat" are almost, if not entirely forgotten. One name alone continues to be remembered, and will be for future generations. The owner of it, the best and bravest of them all, is buried under the ramparts of Fort Moultrie, and no true lover of his country can gaze upon his grave without bitterly regretting the treachery of the United States Government shamefully displayed in capturing Osceola.

A striking instance of the way in which the great staple of the South seeks a market by the quickest route was afforded by the completion of the Savannah, Florida and Western Railway to Bainbridge, in southwestern Georgia, some years since. Up to that time Apalachicola on the Gulf, was a lively commercial town, receiving yearly 200,000 bales of cotton. But when the snort of the iron horse was heard on the banks of the Flint River at Bainbridge, all cotton-loaded steamers ascended that stream instead of proceeding downward to the Gulf where, when shipped, the cotton had to undergo the long voyage around the Florida reefs and pay extra insurance for the danger incurred in crossing the Bahama Banks. From that time Apalachicola was financially and commercially killed, and its merchants, like rats deserting a sinking ship, hurried off to Mobile and New Orleans. It is now about as dead a town as the United States can boast of, and Savannah profits by its downfall.

After the passage of the new amendments to the Constitution, the unwashed American freedmen gave great discomfort, particularly in hot weather, to railway travelers in the South. They insisted on having the choicest seats, loudly proclaiming their right to them. But the evil soon corrected itself; our brethren of African descent have, like John Gilpin, a due regard for economy, even when bent on pleasure. By judiciously placing second-class cars on all passenger trains, charging less fare, and above all giving them the privilege of smoking, the negroes willingly accepted the compromise. They generally ignore pipes, but smoke large quantities of villainous cigars when traveling. By their continual migrations from one Southern State to another, they have increased considerably the receipts from passengers. The railways bordering on Texas are the greatest gainers, and the theory that our Southern negroes have strong local attachments has thus been signally refuted.

It will be seen that the traveling public cannot reasonably find fault with the time made by the passenger trains on the railways between New York and Florida; but there is still room for great improvement in this respect. From Weldon to Jacksonville the roads are built mainly on level ground and very few curves are met with. A high rate of speed can safely be obtained with these natural advantages, and with powerful locomotives of the "Wootten" order, 45 miles per hour could easily be made. The distance, too, could be shortened considerably by building a railway from Goldsborough direct to Florence, thus avoiding the elbow formed by Wilmington in the present route. Such a road has been talked of for years past, and sooner or later will be completed; and there is reasonable ground for believing that, judging from the past, before the present century expires, twenty-four hours only will be required to reach Florida from New York.

LUBRICATING AND LUBRICANTS.

BY E. F. DIETERICHS.

[Written for the AMERICAN RAILROAD JOURNAL.]

VII.

LUBRICATORS, OIL AND GREASE CUPS.

THE many contrivances commonly called "lubricators," by which lubricants are applied to machinery, are a source of much trouble to engineers and frequently give them occasion to display their ignorance as to the characteristics and proper handling of these lubricators. The adaptation of these contrivances is with many just as much a consideration of price only, as it is in the purchasing of lubricants; but with lubricators as well as with lubricants the best are the cheapest.

There is the old-style cup, the old-style pump, and the modern automatic devices. With the old-style pump and cup much of the lubricant is wasted, as the feeding is too

instantaneous, and even under careful handling a much larger amount of oil is pumped and spasmodically applied to the parts requiring lubrication than can at once be effectually distributed, so that by use in cylinders much is blown out by the steam and uselessly wasted, and as they require handling, the neglect of timely attention frequently causes the machinery to suffer. This is to a great extent overcome by the modern automatic contrivances which, if properly handled and adjusted, the principle on which they are intended to do their work being well understood, will do the oiling as regularly and economically as any machinery made to abide man's will. There are a great many of these contrivances, the larger number, however, gotten up with no other practical idea than to produce a profitably selling patent contrivance of some kind or another. Some of them appear, at first sight, very ingenious and satisfactory, but fail altogether in possessing the requisites of thorough and reliable lubricators.

The automatic pumps operated by motion taken from the engine and machinery, and pumping the oil to the place to be lubricated, when kept in good order and properly adjusted, allow the most regular and reliable feeding. These pumps lubricate when the engine is in motion, and cease to do so when at rest, and are always ready to start with the engine unless empty through neglect. By this kind of contrivances the oil is conveyed to the place where it is expected to do the work, perfectly cool and unchanged. Contrivances of like construction with spring-motion operated by means of eccentrics attached to the engine and machinery, are also reliable feeders, and oils applied through them reach the place to be lubricated direct and cool. Both these kinds of lubricators give an equally fair chance to all lubricants of any reasonable quality, and only lubricating oils of highly gumming character, or those full of grit and impurities feed through such contrivances with difficulty, if at all.

We come now to the so-called "sight feeding cups." Some of them are very ingenious and useful contrivances; others, however, are merely clever toys and cause much difficulty by the necessity of the operator understanding the principle on which they are intended to work. The mere filling them with oil, turning on steam, opening the valve and calmly awaiting their accurate working will not insure success, and the occasional blowing of steam through with the view of cleaning them is equally fallacious. The oil is, in these cups, in constant contact with water and its impurities, and in many of them, especially if the operator, as above stated, misunderstands the theory on which their automatic working is based, the oil is continuously kept at steam heat. With some oils this would not matter, as they require to be heated to retain fluidity enough for application, but to oils intended to accomplish the greatest absorption of frictional heat—that is, good lubricating—such previous overheating causes great loss of their lubricating power, is entirely unnecessary and positively injurious. The better class of these cups, however, work very satisfactorily, and any shortcomings are the results of ignorance and misunderstanding of the theory on which their working is based.

When starting such cups with oil it requires judgment to secure first, a sufficient amount of cool, condensed water in the cup to control therewith and therewith alone, the automatic feeding of the oil. In many instances, however, the direct steam or the condensed water kept too hot by too much steam on it, is allowed to act on the oil and control the feeding through the cup, and if this has been done for some length of time—especially when an oil of a decomposing nature was in use—the tubes become coated with gummy deposits which, under influence of the latent heat retained by the metal at every change of temperature in the cup, become baked and hardened to the sides of the tubes. If then, an oil not liable to decompose and form gummy deposits is introduced, unsatisfactory results at first must be expected. Such oils applied in small quantities gradually soften these deposits, and swelling, they become finally dislodged and impede the free passage of the oil, and if the oil possesses any good clinging property, oblige it to hang to the sides of the tubes thus coated.

The pretended cleaning of cups by blowing steam through them is another source of trouble, as thereby the fatty deposits from oils in connection with impurities of the water used are baked to the sides of the tubes in successive hard layers by the latent heat held there by the metal, precisely as the scales in boilers are produced from the slimy, earthy deposits from the water by baking and incrustating them to the iron by latent heat under the prevalent and injudicious practice of "blowing off" boilers. If the tubes are kept clean and care is taken to operate the cup on the displacement principle by cool condensed water only, there can be no difficulty in feeding satisfactorily through them as is fully demonstrated by the fact that the same kind of oils which are claimed by some engineers as incapable of feeding properly through their cup are intelligently and satisfactorily used by others through cups of precisely the same make and construction. It requires a little time and patience when starting or refilling such cups to wait until sufficient steam has condensed and enough water accumulated to operate them and get the oil to feed with proper regularity. Introducing some water in the cup before filling with oil and slowly turning the steam on and regulating the feed will prevent overheating and secure and regulate at once the proper condensation and regular displacement of the oil. As the oils are the lubricant expected to do the lubricating, it certainly stands to reason that the cup performing only auxiliary duty could not be proficient, if not suitable for all oils which are otherwise entirely capable and efficient.

There is another endless number of cups of all kinds of construction to apply lubricants to the bearings of shafting and all kinds of lighter machinery; and for feeding oils those appear to command the most attention which allow the operator to judge at a glance if the feeding is regular and uninterrupted. They all require more or less adjusting to regulate properly the amount to be fed and allow the oils to pass through the aperture according to their limpidity or viscosity. In some of them the flow of oil is regulated by regulating the width of the aperture with closing or opening devices; in others a wick is placed in the aperture to secure regular and slow feeding on the capillary principle, and still in others a stem with flattened side to prevent a too rapid flow of the oils. If they are properly attended to and judgment is used in adjusting them in accordance with the characteristics of the oils employed, most of them will answer their purpose satisfactorily.

In those cups which feed with a wick it is very important that the amount of strands in the wick should be in

proper proportion as to the limpidity or viscosity of the oil used, and in those operating with a metallic stem with a flattened side, the latter should be filed still flatter or the stem removed entirely when a change is made from a limpid and easy flowing oil to one which has a heavy body and uniformly retains its consistency. It is also necessary that in all these cups, exposed to varying temperature, only such oils should be used as will not congeal and thereby become unable to flow and feed through the aperture. Frequently also, when changing from one oil to another, and especially when the oil first used was of a gummy character, and the new oil does not possess this quality, the oil may feed well enough through the small apertures without adjusting, but on account of the almost imperceptible coating or gummy film on the close fitting surfaces, it is unable to force its way through; and the bearing running warm, the oil will be unjustly condemned as a poor lubricant. A slight loosening of the screws holding the cap down and allowing the oil to flow in freely and get around the parts to be lubricated will remedy the difficulty, and readjusting the screws, the feeding will go on regularly.

Cups especially intended for feeding grease are also of varied construction and character. These also should have apertures appropriate to the melting quality of the grease used. There are some cups that are intended to force the grease down by weight, by springs, and by hand-pressure, and all, in consequence of this, require constant attention and cannot properly be considered automatic feeders. Those provided with metallic stems to work on the principle that the frictional heat conveyed through them shall melt the grease and make it flow down on them also fail to secure perfect lubrication, as they can only begin and continue to lubricate after frictional heat sufficient to keep the grease melting, has accumulated on the bearing, and as running machinery under increased heat means expansion of the metal and abrasion of the parts, the deficiency of such lubrication is apparent.

All of these grease cups fail to work satisfactorily in places where they are exposed to cold or changeable temperature, and the only reliable and judicious lubricating with grease is through long-slotted apertures in the box which allows the grease to touch the surfaces of the parts in motion. It is, however, always provided that the grease is of a nature to retain a nearly uniform consistency at all temperatures.

(To be concluded.)

A STUDY OF FACTS.

THE investing public ought to be enabled to save themselves immense tribulation and loss by a study of Poor's Manual for the past year. It teems with cautions which should lose none of their force by being embodied in figures. More than this, it reviews its tables and directly announces warnings. There is no form of investment that requires such subtle and watchful discrimination as railway securities. The Manual shows that since 1880, a period of three years, there have been opened in the United States, 28,405 miles of railroad, and that 6,091 miles were opened the past year up to the close of the fiscal years of the several companies. The increase of share capital and indebtedness of all the companies for the three years ending December 31, 1883, was $2,093,433,054, the cost of the new mileage as represented by share capital and debt being about $70,000 per mile. The increase in the three years of the funded debts of all the companies was $924,165,440; of their floating debts, $169,880,406; of the two, $1,094,045,846. It is not probable that the cost of the mileage constructed in the three years equaled the increase of funded and floating debts by at least the sum of $200,000,000. The cost of the mileage constructed certainly did not exceed $30,000 to the mile. The whole increase of the share capital, $999,387,208, and a portion of the funded debt, was in excess of cost of construction. Stocks and bonds to the amount of $530,132,000 were listed at the New York Stock Exchange in 1883. The amount of stocks and bonds listed was equivalent to about $80,000 per mile of new road built during the year. A considerable amount, however, of the securities listed was on account of old works.

It is in this immense increase of fictitious capital that is to be found the cause of the general distrust which prevails, and the enormous decline in the price of railroad securities. From 1879 to near the close of 1883 a most singular delusion rested upon the public as to their value, and this delusion was taken advantage of on a vast scale by able and unscrupulous adventurers. Whatever was manufactured and put afloat was seized with avidity by an eager and uninformed public. The delusion was increased and prolonged by payments on a very large scale of interest and dividends from capital. In this delusion the most loud-mouthed and unscrupulous promoters usually had the greatest success. The delusion culminated about the time of the opening of the Northern Pacific, in connection with which visionary schemes of immense magnitude had been put upon the market. Their worthlessness, and the rapid decline of their securities, exerted a powerful influence over the public mind, which continues unchecked to the time of writing this.

The distrust extends alike to good and bad, so that prices at the present time have as little reference to values as they had at the beginning of 1883. The distrust will probably continue until time shall show what securities are really well based. One cause of the great decline in the shares of lines which were dividend-paying, is the competition resulting from the construction of rival lines. The result of this competition is particularly shown in the two great Pacific roads, the Union and Central, both of which, for many years, have regularly paid dividends, but both of which have now been compelled to forego them. A few years ago there was, in public estimation, no more inviting field for railroad enterprises than the State of Colorado. A vast system of railroads, covering the whole State, was constructed with very great rapidity, involving a nominal expenditure of nearly $100,000,000, almost the whole of which is unproductive.

Such a waste of capital is greatly to be regretted. The remedy, if there be any, lies wholly with investors. In nearly all the states and territories the construction of railroads may be carried on under general laws, and without application to their respective legislatures. In prosperous times the success that old lines have achieved is predicted of every new one, and the public are attracted into the new by having issued to them often three dollars in securities in various forms for one of cash paid in. It not unfrequently happens that the venture, in the outset so promising, involves the loss of all the money actually paid into it. In the greater number of cases the disasters

that have overtaken numerous enterprises, or schemes, could have been easily foreseen, and were foreseen, by persons familiar with the manner in which such enterprises or schemes were gotten up and put upon the market, and familiar with the sources, tendency and extent of the freight and passenger traffic of the districts or sections which such schemes were professedly to accommodate, and the provision already made therefor.

It is safe to assume that the new mileage constructed in the past three years cost about $30,000 to the mile; and that when our people build, say, 10,000 miles of line in one year, they expend upon them $300,000,000.

In addition, a very large amount of fresh capital is yearly expended on old lines, so that we have for many years past been expending upon railroads considerably over $1,000,000 for every working day in the year. Should a large portion of the cost of new lines be lost, the country is undoubtedly the richer by a corresponding amount from the incidental advantages they confer—the opening up of vast tracts for settlement, and bringing within the reach of markets, products which before had no commercial value.

If it be assumed that the cost in money of all the roads in operation in the United States in 1883 did not exceed, as it certainly did not, the amount of their funded and floating debts, $3,787,410,728, the actual investment was a most profitable one. The net earnings for the year were $336,911,884, a sum equaling about 9 per cent. on their cost. If the fictitious capital could be eliminated from their accounts, their success, as investments, would have no parallel. If to net income be added the advantages that flow from them, the result would be a matter of especial wonder. Our railroads the past year transported over 400,000,000 tons of freight. At $25 a ton the value of this freight would equal $10,000,000,000. It is enough to say that, compared with the wealth of the country thirty years ago, they have created on this continent a new nation. While penetrating every portion of the continent, at least wherever our people go, they for the first time create the conditions of a firm and compact nationality.—*Western Insurance Review.*

RAILWAY DISCIPLINE.

LAST week we discussed—or rather, perhaps, rehearsed—some of the points connected with the present state of discipline in the great American army of railroaders, but without coming to any conclusion except the universally accepted one that there is room enough for improvement, but no very well-known way of attaining it. Where we lack knowledge, we can, if we are inclined, guess; and when certainties are not within our reach, speculation sometimes is not wholly unprofitable.

Now, as to discipline, which we think all will agree is the keyword to improvement in the service, what can we learn from others' experience? The management of armies is the most available pattern to study, but the immediate and perhaps insuperable objection there would doubtless be that governments have unlimited money to fall back upon, and that therefore any attempt at imitation of the gilt-edged and stiff tactics of military circles is entirely impracticable and out of place in such commonplace and practical matters as train-running, etc. Governments, being supported by taxes, are users of money, not producers, and officials, whether civil or military, get their habits of mind firmly fixed in the belief that their business is wholly to consume wealth and not to conserve it, while the railroad officer must keep his wits sharpened at both ends, the net *profit* from any given plan or action being always the important question to be decided. But, notwithstanding this objection, we may learn something here; if we cannot copy military manners in their entirety, it may be profitable to study certain features of them. Without attempting anything like a general comparison of military service with railroad service, let us notice one or two points.

A noticeable principle in military operations is, that there is always an officer, with well-defined limits of responsibility, in immediate charge of every undertaking. There is never any uncertainty as to who is "boss"; not that high officers attend to petty details, but every movement, even if of only a half-dozen men or less, has an immediate director, and investigations of irregularities do not depend so wholly upon the unintelligent and warped testimony of subordinates as we sometimes see in railroad experience. The idea of an officer for every petty job at once suggests the chief objection, expense; but it should be remembered that it is not a high-grade officer that is contemplated, but simply a system that shall always provide for clearly-defined authority. In railroad management there seems often to be a tendency to have a wide gulf fixed between the superiors and the subordinates, thus creating two separate and opposite classes; this does not tend to foster a good and familiar understanding of their respective duties between the different grades, as is always desirable, but rather the opposite. Multiplication of grades of officers and clear division of duties does not, however, necessarily involve much additional expense in every case, the idea being not so much to add more supervisory officers to a given force, but rather to make a more careful and systematic use of the men already belonging to it. A familiar example of the anomalous condition of railroad operating is the ordinary freight-train. The conductor, who is nominally the captain, is nearly always the inferior, both in natural ability and mental training, to the engineman, and his own knowledge of this fact weakens his confidence in himself and impairs his efficiency, not only as concerns his own conduct, but as a director of the behavior of others.

Not infrequently we hear of cases of misconduct and negligence, sometimes serious, which are the direct result of *habits* more or less reprehensible, and which have been long continued, but which the supervising officer avows his entire ignorance of. It ought not to be a difficult matter, with the right kind of officers properly related to each other, to correct this. When superintendents are well informed about the *habits* of their men (as concerns obedience to rules) they will not be taken so completely by surprise by lapses from duty, as is frequently the case at present.

One of the most important principles of military training is the constant *drilling*, which, to the unsystematic mind, is mere useless repetition of meaningless actions, and which appears to the restless and always-take-the-shortest-cut Yankee to be intolerable red tape. And yet it would not be so very far from the truth to say that a considerable portion of the railroad accidents caused by negligence of employés is the result of the general

neglect of this means of instruction. American railroad service is, *par excellence*, the place for those who seek to acquire that proficiency which comes from practice, *after* they assume the responsibilities instead of *before*.

Drilling is the only means of preparing beforehand for sudden emergencies of various kinds. Soldiers behave creditably amid the excitement of battle because they have been taught to do the right thing at the right time without thinking, or at least without appreciable mental effort. A brakeman errs in judgment of distance or time when sent back with a flag because he has *not* been trained to perfect familiarity with the exact requirements of his duty, and so has to do his thinking when his mind is not in the most favorable condition for it. A conductor blunders in reading the time-table because he has not been trained *always* to look at *all* the necessary points. Both conductors and enginemen lazily depend upon each other, because they have not been taught by enforced practice to assume certain responsibilities independently.

Managers assume a certain degree of reliability in their men because the latter have been "taught" to obey certain rules, and the failure of their assumptions could often be explained by a glance at the difference between the term "to teach" and its counterfeit. Telling a person to do a thing is easy, but *teaching* implies mental action on the part of the person taught. His attention must be secured first of all, and in many cases that is not by any means easy. It is very far from certain that a man understands an order simply because he has received a printed copy of it. It sometimes seems as though the *only* way to be certain that a man knows how to do a thing which he has been instructed about is to have him actually do it, and it surely is the only safe way when dealing with large numbers of men of widely varying capabilities. So long as railroads continue to drill their employés only by the "hard knocks" of actual service without close supervision, instead of by preliminary training under proper instruction, where inexperience and ignorance cannot result harmfully, just so long will they continue to have accidents, of which they will want to conceal more or less of the causes. By the former method a man acquires skill by stumbling into it; by the latter he is inducted into it. The former is the more natural way, perhaps; but the other is the simpler and so the better.—*Railroad Gazette.*

THE DINING-CAR SYSTEM.

THE dining-car has probably come to stay with us, and it remains to be seen whether it can be run as a revenue-producing item in railway operation, or whether it must be a dragging expense as are some other matters connected with the passenger department.

Many arguments can be made against the use of dining-cars, but it seems fair to assume that the situation must be accepted as it now stands upon roads which have adopted them, and that the only matters open for discussion are those relating to methods of their economical operation. The dining-car originally was run by a few lines in order to gain an advantage over their rivals, even though not paying operating expenses, as the extra traffic drawn to these lines was supposed to more than balance any loss in their direct operation. As time went on, competing lines followed suit, until now the roads running them are obliged to continue their use or fall behind their rivals.

There are yet a large number of important lines which do not use these cars, and in the case of roads running east from Chicago, while they are used in some lines their rivals seek to avoid running them by means of well-kept dining-rooms at convenient points, and there is not wanting a large proportion of the traveling public which had rather leave the cars and take meals at these rooms than patronize the lines running dining-cars.

We find where dining-cars are run that the results of their use as regards paying their expenses vary widely on different lines and even upon the same roads at different times. In some cases upon the same line they may not only succeed in paying expenses but may even show a material net profit, while again at another period there may be a large net loss. There are, of course, numerous circumstances entering into the methods of operating such cars which have a direct bearing upon the financial result, and it may be of interest to examine into some of the items connected with their management and expense to determine, if possible, the conditions under which such cars can be most profitably run.

There are several well-defined items of expense connected with the running and management of dining-cars. The first is the cost of repairs upon the car proper, or, what amounts to the same thing, the mileage paid in some cases for use of such cars, which is supposed to cover also the bulk of the repairs. Next we have the renewals to the equipment, including utensils, dishes, glassware and linen. We then come to the operating expenses proper, as the former items may be considered as necessary in keeping up the standard of the car and outfit. Under the head of wages we have the amounts paid to conductors, cooks and waiters on such cars. The laundry expenses follow, whether such work is done directly by employés of the company or by outside parties. Then comes the large item of supplies, which covers all the material used in the kitchen, including fuel, and that which goes upon the table as food. The item of supplies may also be divided to some extent into perishable and non-perishable, the former including such articles as meats, vegetables and fruits, which are intended to last but a limited time, and are generally kept by means of ice. The second class includes the standard groceries, condiments and relishes of different kinds, which if not used one day continue good for a greater or less time.

The total expense incurred in running a first-class dining-car for a year may be assumed as not far from $15,000 to $20,000, depending to some extent on the character of the business done and the expense incurred upon the outfit and operation. This total, which is made up of the different classes of expense which we have just detailed, may be divided into two groups, one in which the amounts expended are independent to a certain extent of the business done by the cars, while the other increases or decreases in amount to a degree more or less proportional to the volume of business received. Under the former class we may include the cost of repairs or mileage, the renewals to equipment and wages of employés. Under the second class we may include the supplies and laundry expenses.

The matter of supplies is by far the largest single item involved, but the fixed expenses, as they may be called, amount to a considerable percentage of the whole, so that the larger the business done the less the cost per meal for

such expense. While, also, the matter of supplies increases or decreases to a certain extent with the business done, such variation is less than that on the amount of business. It follows, therefore, that even with this class of expense the cost per meal is decreased as we increase the number of meals given. Under such a condition of affairs it seems to be a necessity that each car should feed as large a number of persons per day as possible in order to make the operation of the system a success. In our estimation, we are assuming an attractive but not too varied or extravagant bill of fare, and the highest perfection in methods and neatness of cookery and serving. Under such a condition of affairs, the best data we have been able to obtain seem to show that where the cars are run to serve two meals per day on each one, they can hardly, by the most economical management, be made to pay expenses at seventy-five cents per meal. If three meals are served, with a reasonably good attendance, the expenses per car should be fully covered by the receipts, while if four meals can be provided there is every condition for an economical management to show a moderate profit at the end of the month in each car. Four meals per day may be assumed as the limit that can be served per car and due time be allowed for each. But to supply four meals per day will demand good calculation in the arrangement of the dining-car runs so as to serve different trains.

There is one important item in relation to the economical running of dining-cars and that is the question of reduced rates to train men. While it seems fair that some reduction should be made to employés, as the company would not desire to make a profit from their meals, still there should be a limit both to the number of employés who should be entitled to such reduced rates, and also to the amount of such reduction. While it is urged that a certain amount of provision is provided, no matter what the number of consumers may be, and that it is better to use such material up at even low rates than to waste it, it must yet be remembered that the partaker of the meal uses his full proportion of the plant and also of the eatables which are not strictly perishable. If, for instance, a rate of twenty-five cents per meal is allowed to employés other than those actually employed in the car, it would seem but just that some limitation be made to the bill-of-fare, and that the meal in character and variety be reduced more to a par with what the same money would bring elsewhere. This closing suggestion may be considered as having an extra economical sound, but the dining-car at best is an expensive adjunct to our roads, and it is really necessary to watch every avenue of expense, especially when we remember the remark in the *Car-Builder* that "it has come to stay."—*Railway Review.*

Railway from Sweden to Lapland.

THE North of Europe Railway Company (Limited) has been formed in London, for the purpose of constructing a line of railway from Lulea in the Gulf of Bothnia to Ofoten Fjord in the North Atlantic Ocean, and thereby opening up the rich stores of mineral wealth in that part of Lapland, and especially in the mines of Kirunavaara, Liosavaara, and Gellivaara. The legal guarantee has been deposited with the Swedish and Norwegian Governments, and Mr. P. Von Ehrenheim and Captain C. G. Hjertaboth, gentlemen of high standing in Sweden, and Lieutenant Land in Norway, have been appointed resident directors. It is expected that one-third of the line, the Lulea-Gellivaara section, will be completed before the end of this year, the country being fairly level and easily traversed. Great results are anticipated by the local authorities from the opening up of the districts by this railway and also in peopling the northern provinces of Sweden, which now consist principally of waste lands, and are almost uninhabited. The province of Norrbotten, in Lapland, contains 105,000 square kilometers out of the 440,000 which form the whole of Sweden (nearly one-fourth of the kingdom), while its population only amounts to 92,000, or to not quite one person per square kilometer; nevertheless Norrbotten is Sweden's richest province, its iron ores being unsurpassed anywhere in quality or magnitude. The great drawback to this province has always been the want of communication with the other parts of Sweden; along the banks of the river Tornca the land is fairly well populated.

Railways in Queensland.

THE annual report for 1883, says the *Railway Age*, of the commissioner for railways of Queensland, the northeasterly subdivision of the continent of Australia, contains some interesting particulars, in view of the fact that the railways of that country are owned and operated by the government. The total mileage at the close of 1883 was 1,038 miles, of which 141 were completed during that year. The average cost per mile is given as about $34,165, inclusive of equipment, making a total expenditure up to December 31st of last year of a little over $39,000,000. The largest system, the Southern and Western, embraces a mileage of 516 miles, the main line extending from Brisbane to Mitchell, a distance of 370 miles. The Central railway extends from Rockhampton to Pinehill, 252 miles, with a branch from Emerald to Clermont, making 307 miles in all. All the railways, with one small exception, extend from the coast westward into the interior, and no connecting lines have been constructed. A line along the coast is projected and a small portion of it built. If the immense interior tracts are at all adapted to settlement, the present railway mileage will have to be multiplied many times before the country is fully supplied with facilities for transportation. That the railways are fairly profitable is evident from the fact that the interest paid by the net earnings for the year on the capital invested was 4.218 per cent. The total receipts for 1883 were $2,952.755, and the operating expenses were 49.33 per cent. of the amount received. The revenues from freight were 70.98 per cent. and those from passenger traffic 29.02 per cent. of the total receipts. The revenues from the transportation of live stock were comparatively small, being only 2.53 per cent. The total average receipts per mile were $2,840, showing a light business compared with that of the roads of this country. The general condition of the manufacturing interests is indicated by the fact that locomotives, car-wheels and axles and car-trimmings are necessarily imported. The cost per mile of these railways built by the government is notably less than that of the lines in other British colonies. The Queensland railways are of three feet six inches gauge and cost £6,833 per mile, while those of New South Wales, which are of stand-

ard gauge, cost £12,499 per mile, and those of Victoria, the gauge of which is five feet three inches, cost £14,573 per mile. Those of South Australia, the guages of which are five feet three inches and three feet six inches, cost an average of £6,094 per mile. These wide variations would seem to indicate not only a difference in natural obstacles to be overcome in constructing the respective lines, but, also, it may be, a difference in governments.

Altogether it would seem that the operation of the railways by the government of Queensland is very successful. The mileage is small, the traffic is moderate, and the number of employés is not large. The country is a province—not a continent. If the interests represented by this admirable report were multiplied a hundred fold they would become far too large to be controlled by any government with justice to itself or with safety to the people. Queensland is small and isolated now, and the success of government construction and operation of railways in a country so peculiarly situated affords few final conclusions as to the best policy for a country, several of whose railway systems surpass in the magnitude of the interests which they include, those embraced in all the departments of the government of that colony.

Early Ideas of Railway Construction.

THERE is a touching simplicity in the following "instructions" taken from the London Encyclopædia of 1829: "In laying out a line of railway no further general rule can be laid down than that regard should in the first place be had to such a direction and such a declivity as may best suit the nature of the ground through which it passes, and the trade to be carried on upon it. If the trade be all or chiefly in one direction, the road should of course decline that way, so that the wagons, with their contents, may descend upon this inclined plane as much as possible by their own weight. If the exports and imports be equal, the road should be on a level; and, when the ground will not permit that declivity or level best suited to the trade, the line should be varied, and the inequalities made up, so as to bring it as near as possible to the proper standard. If the inequalities are such as to render this impracticable, the only resource lies in inclined planes; for instance, when the difference of level between the two extremes of the road is such as would render an equal declivity too steep, the road must then be carried either on a level or with the due degree of slope, as far as practicable, and then lowered by an incline plane, on which the wagons are let gently down by means of a brake, and dragged up by means of an additional power to that which draws them along the road, or at once let down and drawn up by means of a roller or pulley."

Car Awnings.

COMPLAINT is made in Mexico, of the extreme heat often prevailing in the Pullman cars, caused, not by the temperature of the air, which is not excessive on any part of the tableland, but by the fierce rays of the tropic summer sun beating down on the roofs and heating the cars like ovens, so that they do not cool off until far into the night. The remedy for this, says the *Mexican Financier*, would be double roofs, or their equivalents in the shape of awnings stretched over the roofs, an expedient which has been tried with great success elsewhere. It is probable that by this means the heat could be reduced by several degrees, and one of the greatest drawbacks to travel by railway removed. The car of the general manager on the Sonora Railway is thus provided with an awning which gives the most satisfactory results. In order not to obstruct light and air from the ventilating windows it would be advisable to divide the awning into three sections, one being stretched over the raised portion of the roof, and the remainder over the roof at the sides, below the ventilating windows. It would probably be also desirable to protect the roofs of the first-class cars in the same way, the additional comfort thus giving them a most substantial advantage over the second class.

The Uniform Railway Signal System.

THE following is the system of uniform railway signals adopted by the recent Time Convention held in Philadelphia, on October 9th:

HAND AND LAMP SIGNALS.

Go ahead—A motion up and down.
Stop—A motion crosswise with the track.
Back up—A motion in a vertical circle.
Train parted—A motion in a vertical circle at arm's length across the track, given continuously until answered by the engineer.

BELL-CORD SIGNALS.

One (1), (when train is standing) start.
Two (2), (when train is running) stop.
Two (2), (when train is standing) call in flagman.
Three (3), (when train is running) stop at next station.
Three (3), (when train is standing) back.
Four (4), (when train is running) reduce speed.

WHISTLE SIGNALS.

Signals.	Use.
——	Signal for approaching stations, railroad crossings, and junctions.
o	Apply brakes; stop.
—— ——	Off brakes; start.
o o	Answer to any signal, except train parted.
—— —— ——	Train parted.
(S) o o o	Back up.
(R) o o o	Calling attention to signals carried.
—— —— —— ——	Call in flagman.
o o o o	Engineer's call for signals from switchmen, watchmen and trainmen.
—— —— o o	Road crossing.
o o o o o	Send flagman out.
Succession of short sounds	Stock alarm.

Explanation of signs: o, short sound;——long sound; (S) slow pulls; (R) rapid pulls.

STATIONARY AND FIXED SIGNALS.

Danger, stop!—red.
Caution, proceed with care—green.
Safety, track clear—white.
Stop for traffic—white and green.

All signals should be placed on the engineer's side of the track as he approaches them, unless the land contours make them more easily seen by the engineer if placed on the other side.

Switch targets should be placed on the engineer's side as he runs toward the point of the switch, as there is more danger when running in that direction than through the switch.

In case separate signals for trains in each direction are placed on the same standard, the arm on the right side, as the signal is approached, should ordinarily govern the movement.

Signals for trains in one direction only, should ordinarily project from the right hand side of the upright, as one stands facing it in the direction of the traffic.

Danger signals for rear protection, should be displayed in an elevated position to the rear only, and never shown when the train is on the main track.

FIXED SIGNALS ON TRAINS.

A green signal carried on the front of the engine to indicate a train following with the same rights as the train carrying the signals.

A combined green and white signal carried on the front of an engine to indicate a train following which is irregular.

A white signal carried on the front of an engine to indicate that the train carrying the signal is itself irregular.

The rear of every train, passenger or freight, should be plainly marked to enable those interested to know that all the train has passed. Green markers are to be used for this purpose, and they should be combined with the signals, so that one lamp can serve both purposes.

TORPEDO SIGNALS.

One (1) danger, stop !.

Two (2) caution, run carefully.

The signal for danger to consist of fewer detonations than the one for caution, so that if one cap fails in a caution battery the signal becomes one of danger.

CONCERNING THE USE OF SIGNALS.

The danger signal to be used to indicate train orders.

Trains on sidings, to clear, should remove their signals of danger and display those of caution, otherwise trains passing on the main track will be stopped.

The rear of the train is the part that, when the train is proceeding in its authorized direction, will pass over a given point last, and markers should be displayed on that part and no train should be reported or considered by, until the markers are seen.

Fast Railway Speed.

A YEAR ago the Great Northern Railway Company commenced to run between Manchester and London in four and one-half hours, a distance of 205½ miles, stopping at Grantham and Sheffield only. Their example was followed speedily by the London and North Western Railway Company, who have, however, a distance of only 189 miles. This month, however, the Great Northern Railway Company have further reduced their time to four and one-quarter hours. It remains to be seen if the rival line can do their 189 miles in four hours, which it should manage with the difference of sixteen miles in its favor. So far the Midland has taken a longer time than this, and this line is unfavorably handicapped by its heavy climb to Peak Forest, but its fastest train is timed to four hours and ten minutes.

Theatrical Traveling Expenses.

A NEW YORK *Tribune* reporter recently asked Manager Collier of the Union Square company what amount he spent annually in railroading. Mr. Collier replied: "That is something that I have never figured out exactly, but I can give you the basis for a pretty close calculation. My average fares for each company will be about $125 a week. For the five companies playing on an average thirty-seven weeks each, this amounted to over $23,000. But that sum does not include the expenses of the home company, which generally travels for eight or ten weeks prior to their playing at this theater, or the freight on printing shipped in advance of each company to every stand at which it plays, or my own expenses on the frequent trips I am compelled to make. Altogether, the amount we annually pay to railroads must be considerably over $30,000. With each of the 'Storm-Beaten' and 'Lights' companies," continued Mr. Collier, "is a car for scenery, built by the Pennsylvania Railroad according to my design. Each car is over sixty feet long and contains two low trucks, on which the scenes are packed. When the car arrives in a town, these trucks are pulled out and hauled to the theater, and after the performance are reloaded and once more put in the car. By this arrangement a vast saving of time, labor, and wear and tear is avoided. Indeed, if it were not for this plan, it would be impossible to present such heavy pieces in one night stands. The 'Lights' requires eleven complete scenes, and though 'Storm-Beaten' has not as many, the elaborate character of several of the sets causes almost as much 'stuff' to be carried. With each car goes every 'property' required in the representation, except ordinary furniture procurable in every theater, including calcium lights and machinery for producing the aurora-borealis effects, so that I give just as perfect a presentation in every particular at, say Penn Yan, as I did at the Union Square Theater. Each of the cars, with its scenery, properties, etc., is insured for $10,000."

Military Railways in France.

THERE are now four railway companies of the French army (*compagnies militaires d'ouvriers de chemins de fer*), one being attached to each of the four regiments of engineers. Their peace footing is a low one, and they are brought up to their war strength by calling in the reserve men dismissed to their various employments in the service of the railway companies. Under the new reorganization scheme the men of the railway troops are to be retained under the colors only one year. They are then to be distributed amongst the various railway companies, further trained in their respective duties, but treated and paid like the other railway employés, so that they are no further expense to the state. The war strength of a company is as follows: Six officers, three hundred men, fifty drivers (*sapeurs conducteurs*), eighty-two horses and eighteen carriages. According to the scheme of reorganization, four additional companies are to be formed.

IT is asserted on engineering authority that the best wood yet discovered for railway sleepers is zapote, used for this purpose in Mexico. It is essentially a tropical timber, and is exceedingly durable for outdoor or indoor work, above or below ground. Samples of this wood taken out of buildings said to have been erected more than two centuries ago did not show the slightest indications of decay, the wood being as sound as on the day it was put into the building. In color this wood is nearly as dark as logwood, is very heavy and sinks in water, and so hard that the boring of holes for spikes and forming the grooves for rails is very laborious work. It appears to be almost impervious to decay, but has a tendency to split if exposed to the heat of a tropical sun for a few months; for which reason the zapote sleepers have to be equally covered with ballast.

IT is interesting to know, that so long ago as 1848, express trains had arrived at a maximum speed which has not since been exceeded. Below is the copy of a card issued at that time as a memento of the speed of a Great Western train between London and Didcot. The speed here chronicled is at the rate of 67.95, or, allowing for starting and stopping, more than sixty-eight miles an hour. We doubt if many of the present expresses are timed to run at more than fifty miles an hour: "Great Western Railway broad-gauge engine 'Great Britain,' which accomplished the fastest journey on record, namely, from Paddington to Didcot, 53¼ miles, in 47 minutes. The train was the 9¼ express to Bristol, and consisted of four carriages and van, and was driven on May 11, 1848, by J. Michael Almond, driver; R. Denham, fireman."

American Railroad Journal.

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FORGING AHEAD.

THE JOURNAL makes its appearance this month with a new and emblematic cover, and in every respect comes up to the required standard of a railway magazine and review. Our appeal for contributions on "business principles" have met with success, and we are rapidly increasing our corps of contributors, which gathers strength with the increase. The total number of contributed articles appearing in the JOURNAL since the change of policy and management inaugurated with the June number, now amounts to twenty-six, covering a variety of topics, and all of contemporaneous interest; but there will always be room for more, however, and we reiterate our oft-expressed invitation to railway men for contributions of value.

But it is equally gratifying to observe that the JOURNAL is being recognized as of value to railway literature, and despite the dullness of the times our subscription list is steadily on the increase. Complimentary letters are constantly received, enclosing the amount of a yearly subscription and stating that the JOURNAL is filling a special field in furnishing the railway world with an interesting magazine and review; and it does seem as if the magnitude of interests in the operation of railways calls for something a little more dignified than is found in the average trade journal, despite the latter's undoubted usefulness and ability. It is needless to state that our subscription list can never increase too rapidly, and having on several occasions appealed for contributors in behalf of our readers it would not seem amiss at this juncture to appeal with modesty for subscribers in our own behalf. This we do, letting the JOURNAL stand upon its own merits, and confident that the appeal will not be in vain.

THE RESULT.

THE present month has witnessed an election which assures a complete change in our national government on the 4th of March next. We have consistently avoided political discussions in the columns of the JOURNAL, holding to the opinion that it was not the province of a publication devoted to the interests of any one trade or industry to display partisan tendencies; none the less have we held to our personal preferences as citizens. With these preferences we have nothing to do and we would not allude to the election at all, were it not an occasion of such magnitude and importance that an omission in this respect would savor of indifference. The effect of the election upon the futures of the two great political parties is not a matter we shall consider. As representing the interests of railways we have solely to do with the effect of the change upon this industry, for such in sober truth they may be called. Railways are quick to feel the

benefits of active commerce, and a revival of business is nowhere sooner appreciated.

It cannot be denied that the business interests of this country have felt reluctant to transfer the administration to the Democratic party. It is likewise true that the nation at large has been slowly coming to the conclusion that a change in the control of the government would give a healthy tone to politics, in the fact that both parties would feel that they could only remain in power during good behavior. Doubtless the first-named prejudice was simply prejudice, and had no better foundation than the not unnatural distrust of new men and new methods, for the Democratic party has so long been out of power, that its old leaders have retired giving place to new men, while its principles and methods have also undergone modification. Be that as it may, the Democrats have now the opportunity of proving their patriotism and integrity. It is folly for its members to suppose that the narrow defeat which the Republican party has sustained will disrupt the latter, or that the country at large is disposed to regard the Democrats with especial favor. There has simply been a change, in no way remarkable for its sweeping character, and it will take but little mal-administration on the part of Democratic leaders to overcome in 1888, their narrow majority of 1884. It is idle for them to pretend that the whole Republican party is corrupt, basing this assertion upon the fact that corruption has been unearthed in high places. It is the fate of any political party which for a score of years and more has remained in undisputed control of a national government, that certain evil elements will be attracted to it by the opportunity offered for corrupt gain. Noxious weeds spring up in stagnant water, and a political party that has its own way year after year must, to a certain extent, become stagnant. The Democrats found their weeds in their day, and so have the Republicans; they were natural and inevitable conclusions. The Democrats are now on trial, and if in the next four years they maintain the credit and honor of the country as well as the Republicans did in the first years of their power, they will have done well.

Regarding the business interests of the country, we do not believe that they are as dependent upon partisan ascendancy as politicians would have us think. There will always be, in a country of such boundless resources, periods of prosperity and depression succeeding each other at greater or less intervals. The very wealth and extent of our natural advantages tend to this result, and a country of poor resources maintains a steadier condition of affairs—never so prosperous, but rarely if ever subjected to the same fluctuations in national trade and commerce. We look for no quick change in either direction through the success of the Democratic party, but its leaders undoubtedly can do much to hasten or retard a return to prosperity. Honesty, conservatism and integrity on the part of those in control of the government, can have an effect upon national prosperity—but in great measure, if not entirely, it depends upon the men and not upon their party.

We regard President-elect CLEVELAND as an honest man with a clear head, and this belief which is wide-spread and meeting with general acceptance, should do much toward allaying the fears of difficulty always attending a change of government; whether he possesses the requisites of a President, and whether he will be able to withstand the partisan pressure that will be brought to bear upon him is another question. We sincerely hope he will. If, as a result of his election, we are given honest Civil Service Reform, if public office will be regarded as a reward of merit, and not of partisan service, if the industries of the country are not subjected to sudden shocks through "experimental" legislation on the tariff and other questions, and above all, if the insidious nourishment of sectional hatred is wiped out, and we are given a country with no North and no South, we shall rejoice at his election. If none of these sorely needed results are brought about we shall regret it. With one of his public utterances we are in hearty accord. We join with him in demanding a "government conducted upon business principles." Such a government, we honestly believe, will accomplish all that we can ask for, and will usher in an era of peace, prosperity, and fraternal spirit.

Undoubtedly the election of CLEVELAND is a source of great joy to the Democrats who have come up to the polls six times in succession to suffer defeat. Undoubtedly the defeat of BLAINE is a source of great regret to the Republicans who have been successful in electing their candidate for the past twenty-four years. But the extreme closeness of the election, the clearly demonstrated fact that the two great parties are almost equally divided in their claims upon the suffrages of our fifty-five millions of people, should do much to moderate the feelings of both. There is a brief and comparatively unknown verse of poetry that can be quoted here with singular appropriateness, and we give it, in confidence that Democrats and Republicans alike will perceive and appreciate its application:

"Glad—but not flushed with gladness,
For joys go by;
Sad—but not crushed with sadness,
For sorrows fly."

Let us one and all forget our partisanship and extend a helping hand to the new administration. National honor, prosperity and wealth are heritages belonging not to men nor parties but to the people, and should these accrue to us through the change of power, let us not claim them as partisan achievements, but the work of a great people guided by honest leaders. GROVER CLEVELAND on the 4th of March will become President of the United States, and as such he is the property, the heritage of the people—

not of his party. The candidate departed with his election, and the sooner we make up our minds to rouse ourselves and tread the paths we have chosen, the sooner will business prospects brighten, and trade be revived. The 4th of November was a day of bitter partisanship and strife, but it is happily over; and let us so pursue the even tenor of our way during the intervening four months, that the 4th of March will see us one people, ready to welcome our chief executive with honest wishes for his success and prosperity in the mighty task he will take upon himself to carry through in the sight of God and man.

CAR-COUPLINGS AT THE MASTER CAR-BUILDERS CLUB.

THERE was a good attendance at the rooms of the Master Car-Builders Club, on the evening of November 20th, the subject for discussion being "Automatic Freight Car-couplers," and although there were not as many models on exhibition as were brought forward on former occasions, it was gratifying to notice that much of the chaff has been blown out of car-coupling exhibitions, and the wheat that is left has improved in quality. Many of the worthless traps that have heretofore been forced into prominence by a flourish of trumpets and boasts of solid financial backing were conspicuous for their absence, and this fact alone is substantial evidence that the coming coupler is not far off. There was a keen interest manifested by those present, and, as an old timer at these exhibitions expressed it, "the coupling business is getting down fine."

It has been noticed that a majority of the master car-builders have, on former occasions, stated that an automatic coupler was not so much needed as a safety coupler, meaning that safety in coupling is the thing sought for. But of course cost, durability and reliability will be a consideration. The matter of changing coupling attachments is expensive at best, and it would ruin any railway company in the land to equip their cars with the costly automatic couplers that are being pushed by stock companies, regardless of merit. But no railway company need be subjected to a great expense in securing a safety coupler unless the stockholders tamely submit to systematic robbery through the crookedness of their officers, who stand under the tree while it is shaken by committees and commissioners and help themselves to the plums.

From the present day until next March we may look for a large number of tests of coupling devices, and it is expected that by that time the best will be selected for general adoption. But there are those who believe that the best will not be selected for trial, and this remains to be seen. At any rate it does not seem just the thing to rest the case in the hands of a committee and limit them to five couplers for trial, inasmuch as it will be impossible under such a ruling to avoid injustice to many worthy inventions and inventors. This is too serious a matter to trifle with or speculate upon, and let us hope for straightforward and honest dealing by those in authority.

EDITORIAL NOTES.

THE activity and rivalry manifested by car companies is decidedly on the increase, and as a result the trunk lines are being equipped with passenger cars of almost dazzling splendor. Altogether the present year has been a good one for the travelling public, and what with wars of rates and an eager strife for supremacy in the matter of rolling-stock and equipment on the part of the railways, the passenger smiles benignly and calls for the good work to go on.

* * *

IT has been claimed that the railway interests of the country are dependent upon Wall street, and that an attack upon the methods prevailing in that tortuous financial alley is a direct attack upon railways. It may be noticed, however, that this "claim" is made only by Wall street, and its falsity is shown in the fact that of all the railways in the country, not more than fifteen per cent. are listed by the New York Stock Exchange.

* * *

WORK upon the pedestal for the Bartholdi statue has been brought to a standstill through lack of funds, and we are further edified by a disagreement between the committees of the Sons of the Revolution appointed for the purpose of collecting dollar subscriptions, and the general committee headed by Mr. EVARTS. Meanwhile we are rapidly gaining the reputation of being a small-minded people, and the stigma is not undeserved. Eventually Congress may step to the breach and appropriate a sum of money that will assure the completion of the pedestal by the commencement of next Summer, but none the less has our course in the matter been contemptible. It strikes us as an admirable scheme for the exultant Democrats to celebrate their victory by contributing the necessary sum out of their own pockets. They have won a national victory for the first time in twenty-four years, and an opportunity is here afforded them for a noble "celebration." Haven't they any of the campaign fund remaining which they could contribute to this worthy object?

* * *

PROBABLY few people have an idea of their individual importance to the nation, or of the amount of commodities which they require in one way or another. Yet according to reliable statistics the railways of this country during the year 1883, carried nearly 500,000,000 tons of freight, or almost ten tons for every man, woman and child within its borders. The great problem for every one to consider is the query: "What did I do with my ten tons?"

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 14th, 1885.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

IN EXPLANATION.

WE are in receipt of the following letter from Secretary RICHARDSON, of the American Street Railway Association:

OFFICE OF THE AMERICAN STREET-RAILWAY ASSOCIATION,
BROOKLYN, N. Y., Oct. 23d, 1884.

Editor of the American Railroad Journal:

DEAR SIR:—At the final meeting of last year's officers and Executive Committee of this Association, unanimous expression was made in opposition to the use of the word "tramways," as it appears at the head of your street-railway department.

The request was made that the Secretary use his influence with the paper to have the word changed to "street-railway." The word "tramway" is of foreign derivation and use only, and has not found favor either in the United States or Canada.

I make this application, therefore, on behalf of the American Street-Railway Association, confidently believing that you will change the title of this department, as suggested, and abandon the further use of the words "tram" or "tramway" in connection with street-railways. I doubt not it has already been made manifest to the management of your ably-edited journal, that these words will never come into general use in this country.

Wishing the paper a large business success, I remain,

Very respectfully yours,

WM. J. RICHARDSON, Secretary.

In response to the request of the Association the title of this department of the AMERICAN RAILROAD JOURNAL is changed from that of "Tramways" to "Street-Railways." We consider that the American Street-Railway Association, should be the supreme authority and on all questions of this kind, and in the future—for the present at least—the word "tramway" will not be used in our columns.

We wish it distinctly understood, however, that we do not abandon the position we took upon christening this department with the name of "Tramways." We still hold to the belief that it is in every way the better word, being briefer, more specific in its meaning and easier of pronunciation. Neither do we agree with Mr. RICHARDSON that the word will never come into general use in this country, for its utility will some day be appreciated, and the cumbersome terms of "street-railway," horse railway" "surface road" and the like will fall into disfavor; but we do not hesitate a moment in making the desired titular change. We consider it our duty to recognize the Association as the arbiter on all street-railway questions, and therefore bid a long and reluctant farewell to "tramways."

THE STREET-RAILWAY CONVENTION.

THE Third Annual Convention of the American Street-Railway Association, an account of the proceedings of which will be found upon the ensuing pages, is now a thing of the past; but the beneficial influence which will result from the reports submitted and the discussions held, will last until the ensuing meeting. Indeed an examination of these reports will show an exhaustiveness and singleness of purpose on the part of the gentlemen submitting them, which will render their influence perennial. It was our original intention to publish all of these reports in the current issue of the JOURNAL, immediately following the summary of the meeting, but their great length, and the demand in other quarters for their immediate use in preparing the official minutes of the Convention compelled us to be content with three of them, which we print in this issue with the assurance that the remainder will be found in the December JOURNAL.

The reports speak for themselves, and it is not our purpose to enter into a criticism of them—at least not at present. They have been prepared through the unceasing efforts of the various members of the respective committees, and they represent the combined wisdom and experience of the ablest men in the business. That their dictum on matters of such importance should be regarded as that of a court of last resort, seems but natural, and certainly the discussions ensuing upon their presentation should almost entirely settle whatever of doubt may have existed on the expediency of the questions involved.

The convention was a success from every point of view. Not only in attendance, nor in the new membership acquired, but also in the character of the proceedings and their usefulness to street-railway interests. But why—and we ask it in wonderment—does not every street-railway in the country recognize the benefits of membership in the Association, and by the payment of the trifling sums necessary, acquire it and its resulting benefits in the natural way? Take the single question of the removal of snow and ice from the street-railway tracks in Winter. How often has this question been discussed, and how varied the opinions held thereon? If a single street-railway company, desirous of full information on this point, should endeavor to obtain it with the same fullness and accuracy characterizing the report submitted to the Association on that subject which we print on a following page, to what expense and to what labor would it be put in obtaining it? And yet here is the Association, with the wealth and scope of experience of its entire membership, offering its services at a nominal cost to every street-railway in the land for the purpose of imparting this and kindred information.

It is an old saying that two heads are better than one, and certain it is that the combined experience of over a

hundred street-railway managers is better in the consideration and settlement of problems connected with the operations of roads, than that of single persons and single companies. It is this combined experience which the American Street-Railway Association places at the disposal of every company in the United States and Canada; and we hope the time will not be long before the value of membership in the Association will receive full recognition. Those street-railways not as yet belonging to the Association can hardly expect a continued recognition in the way of printed reports and pamphlets that have heretofore been distributed in a generous spirit by the organization, and sooner or later they will either have to acquire membership therein or remain hopelessly behind the times. The increase of membership at the recent Convention was remarkable, over forty roads having applied for it, and we trust at least this rate of increase will be maintained at future Conventions. Should such be the case it can be but a few years before the street-railways of the country will each and all be members, which is a consummation devoutly to be wished.

We had hoped that the next Convention would be held in Philadelphia, in order that that city with its great street-railway interests would be afforded an opportunity of witnessing the benefits of the Association within its own limits, but on the whole it is probably well that the Conventions should alternate between the East and West in order that both sections of the country should be recognized, and it would also be well if one of the Conventions in the near future should be held in Montreal or Toronto, in order that our Canadian friends should have a chance of showing their progress and hospitality. In the meantime the Association can rest secure in the certainty of the success of the St. Louis Convention in October, 1885.

SHOULD STREET-RAILWAYS BUILD THEIR OWN CARS AND TRACKS?

BY AUGUSTINE W. WRIGHT.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE question has been propounded to me from time to time, "Do you think it advantageous for a street-railway company to build its own cars?" My answer has been in the negative, and the question seems of sufficient interest to warrant an expression of my views more at length.

For what purpose is a street-railway company organized? I will answer in the words of M. M. Kirkman, whose able works, although written for steam-railways, should be read by everyone interested in *any* railway: "In the operation of railroads, the objective point of endeavor is the revenue that accrues from the business transacted. It is for this that the proprietors contribute money for the construction of railroads; it is for this that they are operated." All will agree that dividends for the stockholders is what we are after, and the company that invests in shops and machinery with which to construct its own cars hopes thereby to increase the said dividends. The principal reasons advanced for this policy are, either that the company can build *better* cars for the same money, or as good a car for *less* money. In my opinion this is a mistaken idea, and the companies find it to be so, after investing thousands of dollars in extensive plants. The company is organized to carry passengers and the more nearly it confines itself to this business, the greater will be its profits. I do not believe it to be to the pecuniary interest of any street-railway to enter the domain of manufacturers and compete with individuals or firms in building cars.

No one has a greater respect than I have for the ability, honor and zeal of the master mechanics of our railways as a body, but who can honestly say that if the same men were in business for themselves they would not accomplish more work at the same cost. It is proverbial that the laboring classes work harder for individuals or firms than for railway corporations. The individual has a direct pecuniary interest in watching every detail. He has a reputation to establish or maintain for good work, and competition will ordinarily prevent excessive profits. The individual engaged in manufacturing cars, as the years pass by, accumulates a wealth of experience from his extended practise. He has employés engaged perchance for years, working hour after hour, day after day and month after month, on the *same work*. I saw such an employé recently in New York who has spent *twenty years* past on the same work. Over half a century ago, the importance of this fact was set forth by Charles Babbage, the great English mathematician. Permit me to quote Mr. B.: "Perhaps the most important principle on which the economy of a manufacture depends is the *division of labor* amongst the persons who perform the work. * * * A certain quantity of material will be consumed unprofitably, or spoiled by every person who learns an art; and as he applies himself to each new process, he will waste a certain quantity of the raw material, or of the partly manufactured commodity. * * * Another source of the advantage resulting from the division of labor is, that *time is always lost from changing from one occupation to another.* * * * The constant repetition of the same process necessarily produces in the workman a degree of excellence and rapidity in his particular department which is never possessed by one person who is obliged to execute many different processes. This rapidity is still further increased from the circumstance that most of the operations in factories when the division of labor is carried to a considerable extent, are paid for as piece-work. * * * When each process, by which any article is produced is the sole occupation of one individual, his whole attention being devoted to a very limited and simple operation, any improvement in the form of his tools or in the mode of using them is much more likely to occur to his mind."

These remarks I quote to street-railways, whose equipment is comparatively limited. No single company needs new cars enough to warrant an investment in buildings and improved machinery equal to any of the large firms engaged in this business, and without this improved machinery, convenient and extensive shop room and arrangements, they cannot compete in the manufacture; but as a matter of fact, what president or superintendent of any street-railway building its own cars, *knows the cost of*

the same? The master mechanic, perhaps, keeps an accurate account of the labor and material used in building the new cars. He tells his superior officer that they are *better cars* and have cost one or two hundred dollars less than Smith or Brown offer to build the same car for. But he has neglected to figure in the interest on the cost of plant, taxes on the same, wear and tear of tools, depreciation, etc. *This* all goes to repair account, and who can tell how much the latter would have been without the construction account? It cannot be compared with the reports of other companies because one must know, to judge intelligently, the *relative* condition of the cars. and the amount expended upon each. The only *real saving* is in the item of freight if the manufacturer is not located in the same city or town. I speak from experience when I affirm that as good cars, in each and every respect can be purchased from the manufacturer, as are or can be built by any street-railway company. It is undoubtedly necessary to maintain a repair shop, and as work is apt to vary therein in amount, it is no doubt wise for a company to build for its own use "open-cars" when such are used, to retain its skilled labor and give it employment when otherwise the men would have to be laid off and might make other engagements; but one or two such cars would probably bridge over the slack times of twelve months. I believe that any street-railway company engaging in the manufacture of cars is opening a by no means small "bung hole," and its "bar'l" will surely suffer.

Another matter is track construction. It has been largely the practice with street-railways to build their own tracks, and the condition of their tracks to-day shows the folly of this system. Very few steam-railways find it advantageous to lay their own tracks, and I am at a loss why street-railways should pursue a different policy; but they seem to think that any ignorant man, although perhaps he has never seen a track laid, can do their work if he don't want more than $2.00 or $3.00 per diem. The lack of all mechanical skill evinced in the track construction of many of our street-railways would be laughable if it were not so deplorable. I have seen tracks laid with the *rail-joints directly over stringer-joints.* I have seen a "butcher" cutting into a stringer for joint-chair, cut one end half an inch lower than the other end to bring the rail ends level, and insert a chip from the stringer between the chair and the rail! With such work is it strange that we hear an outcry against "poor tracks?" The labor is hired by the day, and nearly every one is interested, not in doing the best work in the least time, but simply in prolonging the job.

If the contractor was encouraged, the men would be more permanently employed; in a measure his interest and theirs would be identical in doing good work, and the company would get better tracks for the same, or less money than under the present system. As a matter of fact, few companies who relay tracks know *what* they cost by hundreds of dollars, because the expense is mixed up with repairs, etc. The supplies are taken from the storehouse or yard to a greater or less extent, and never appear in the cost of this particular track. These views might be enlarged *ad infinitum*, but I trust enough has been said to call attention to the matter, and the officials of all street-railways will find it to the interest of their companies to consider well before entering into active competition with the manufacturer and contractor.

THIRD ANNUAL CONVENTION
OF THE
AMERICAN STREET-RAILWAY ASSOCIATION.

Summary of the Proceedings.

THE third annual Convention of the American Street-Railway Association was held at the Fifth Avenue Hotel, in this city, on Wednesday, Thursday and Friday, October 15th, 16th and 17th, and in point of attendance, increase of membership and interest in the various proceedings, far exceeded those previously held.

The Executive Committee met an hour previous to the assembling of the Convention, and transacted the business before them, and arranged for the final details of the meeting; and at 10.30 o'clock on Wednesday morning the Convention was called to order by the President, Mr. William H. Hazzard, of Brooklyn, who delivered a brief opening address.

The following delegates of members were present:

Baltimore, Md.: T. C. Robbins, Gen'l Manager the Baltimore Union Passenger Railway Company. Binghamton, N. Y.: R. H. Meagley, Pres., Washington Street and State Asylum Railroad Company; F. E. Ross, Treas., Washington Street and State Asylum Railroad Company. Boston, Mass.: Julius E. Rugg, Supt., Highland Street Railway Company; Charles J. Hayden, Director, Highland Street Railway Company; C. H. Shattuck, Master Mechanic, Highland Street Railway Company; Calvin A. Richards, Pres., Metropolitan Railroad Company; I. H. Randall, Master Car-Builder, Metropolitan Railroad Company. Bridgeport, Conn.: Albert Eames, Pres., the Bridgeport Horse Railroad Company; B. F. Lashar, Supt., the Bridgeport Horse Railroad Company. Brooklyn, N. Y.: William Richardson, Pres., the Atlantic Avenue Railroad Company; W. J. Richardson, Sec., the Atlantic Avenue Railroad Company; Hon. Benjamin F. Tracy, Director and Counsel, the Atlantic Avenue Railroad Company; Thos. Murphy, Director, the Atlantic Avenue Railroad Company; Charles A. Richardson, Attorney, the Atlantic Avenue Railroad Company; John E. Richardson, M. D., Surgeon, the Atlantic Avenue Railroad Company; William H. Hazzard, Pres., Brooklyn City Railroad Company; William M. Thomas, Vice-Pres., Brooklyn City Railroad Company; William N. Morrison, Supt., Bushwick Railroad; R. J. Morrison, Inspector, Bushwick Railroad; Walter A. Jones, Vice-Pres., the New Williamsburgh and Flatbush Railroad Company; Charles E. Harris, Supt., the New Williamsburgh and Flatbush Railroad Company. Buffalo, N. Y.: Henry M. Watson, Pres., the Buffalo Street-Railroad Company; Samuel S. Spaulding, Sec. and Treas., the Buffalo Street-Railroad Company; Samuel S. Spaulding, Pres., the Buffalo East Side Street-Railway Company; Henry M. Watson, Sec., the Buffalo East Side Street-Railway Company. Cape May City, N. J.: William Wharton, Jr., Pres., the Cape May and Schellinger's Landing Railroad Company. Chicago, Ill.: Charles B. Holmes, Pres., Chicago City Railway Company; Jacob Rehm, Vice-Pres., North Chicago City Railway Company; Augustine W. Wright, Supt., Track and Construction, North Chicago City Railway Company; James K. Lake, Supt., the Chicago West Division Railway. Cincinnati, O.: Albert G. Clark, Director, the Cincinnati Street-Railway Company; Geo. B. Kerper, Pres., the Mount Adams and Eden Park Inclined Railway. Cleveland, O.: Tom L. Johnson, Pres., Brooklyn Street-Railroad Company; A. J. Moxham, Vice-Pres., Brooklyn Street-Railroad Company; M. S. Robison, Jr., Supt., Superior Street-Railway. Columbus, O.: A. D. Rodgers, Pres., Columbus Consolidated Street-Railroad Company. Concord, N. H.: Moses Humphrey, President, Concord Horse Railroad. Dayton, Ky.: W. W. Bean, Pres., Newport and Dayton Street-Railway Company.

Dayton, O.: Charles B. Clegg, Pres., Oakwood Street-Railway Company. Denver, Col.: B. A. Jackson, Vice-Pres., Denver City Railway Company. Detroit, Mich.: Charles M. Dailey, Gen'l Manager, Grand River Street-Railroad Company. Grand Rapids, Mich.: D. Atwood, Gen'l Manager, The Street-Railway Company of Grand Rapids. Hartford, Conn.: E. S. Goodrich, Pres., the Hartford and Wethersfield Horse Railway Company. Indianapolis, Ind.: Tom L. Johnson, Treas. and Manager, Citizens' Street-Railway Company. Jersey City, N. J.: C. B. Thurston, Pres., Jersey City and Bergen Railroad Company; E. F. Brooks, Consulting Engineer, Jersey City and Bergen Railroad Company; James B. Vredenburg, Director and Counsel, Jersey City and Bergen Railroad Company. Louisville, Ky.: B. du Pont, Pres., Central Passenger Railroad Company; H. H. Littell, Supt., Louisville City Railway. Lowell, Mass.: W. E. Livingston, Pres., Lowell Horse Railway Company; J. A. Chase, Supt., Lowell Horse Railway Company. Montreal, Can.: Edward Lusher, Sec. and Treas., the Montreal City Passenger Railway Company; T. H. Robillard, Supt., the Montreal City Passenger Railway Company. New Bedford, Mass.: Warren Ladd, Pres., New Bedford and Fairhaven Railway Company. New York City, N. Y.: J. B. Slawson, Pres., Central Cross-Town Railroad Company; M. I. Masson, Sec., Central Cross-Town Railroad Company; William White, Pres., the Dry Dock, East Broadway and Battery Railroad Company; Elijah Whitney, M. D., Director, Harlem Bridge, Morrisania and Fordham Railway Company; Albert B. Whitney, M, D., Director, Harlem Bridge, Morrisania and Fordham Railway Company; Jacob Sharp, Pres., Twenty-third Street Railway Company. Niagara Falls, N. Y.: Benjamin Flagler, Pres., Niagara Falls and Suspension Bridge Railway Company. Norwalk, Conn.: James W. Hyatt, Pres., Norwalk Horse Railway Company. Pittsburgh, Penn.: John G. Holmes, Pres., Citizens' Passenger Railway Company; W. W. Patrick, Pres., Pittsburgh and Birmingham Passenger Railroad Company; Harvey N. Rowe, Sec., Pittsburgh, Oakland and East Liberty Passenger Railway Company. Providence, R. I.: Jesse Metcalf, Pres., Union Railroad Company; D. F. Longstreet, Vice-Pres. and Gen'l Man'r, Union Railroad Company. Racine, Wis.: Charles Hathaway, Gen'l Manager, Belle City Railway. Richmond, Va.: Channing M. Bolton, Manager, Richmond City Railway; Charles Selden, Supt., Richmond City Railway. Rochester, N. Y.: Patrick Barry, Pres., Rochester City and Brighton Railroad Company; C. C. Woodworth, Sec., Rochester City and Brighton Railroad Company. Springfield, O.: D. W. Stroud, Pres., Citizens' Street-Railroad Company. St. Louis, Mo.: Julius S. Walsh, Pres., Citizens' Railway Company. Troy, N. Y.: William Kemp, Pres., Troy and Lansingburgh Railroad Company; Charles Cleminshaw, Vice-Pres., Troy and Lansingburgh Railroad Company; D. W. Tuthill, Director, Troy and Lansingburgh Railroad Company.

The following gentlemen acquired membership on behalf of their respective roads:

Baltimore, Md.: George P. Frick, Pres., North Baltimore Passenger Railway Company. Brockton, Mass.: Horace B. Rogers, Supt., Brockton Street-Railway Company. Brooklyn, N. Y.: Joshua Crandall, Supt., Broadway Railroad; Henry Myerholz, Inspector, Broadway Railroad. Cambridge, Mass.: A. L. Richards, Gen'l Manager, Cambridge Railroad Company; John N. Akarman, Supt., Charles River Street-Railway Company. Camden, N. J.: John Hood, Treas. and Supt., Camden Horse Railroad Company. Cincinnati, O.: George A. Smith, Pres., Cincinnati Inclined Plane Railway Company. Cleveland, O.: Charles Hathaway, Supt., West Side Street-Railroad; A. Bartlett, Supt., Woodland Avenue Railway. Dayton, O.: A. W. Anderson, Supt., Dayton Street-Railroad. Easton, Penn.: Henry A. Sage, Pres., Easton and South Easton Passenger Railway Company. Memphis, Tenn.: Raphael Semmes, Supt., Memphis City Railway. New York City, N. Y.: James W. Foshay, Pres., Broadway and Seventh Avenue Railroad Company; G. Hilton Scribner, Pres., Central Park, North and East River Railroad Company; C. Densmore Wyman, Vice-Pres., Central Park, North and East River Railroad Company; William N. A. Harris, Supt., Central Park, North and East River Railroad Company; George Law, Director, Eighth Avenue Railroad Company; John D. Oxner, Pres., Houston, West Street and Pavonia Ferry Railroad Company; Daniel B. Hasbrouck, Sec. and Treas., Houston, West Street and Pavonia Ferry Railroad Company; William S. Thorn, Pres., the Second Avenue Railroad Company; Lewis Lyon, Pres., Third Avenue Railroad Company. Ogden, Utah Ter.: Orson P. Arnold, Vice-Pres. and Supt., Ogden City Railway Company. Peoria, Ill.: H. R. Woodward, Pres., Central City Horse Railway Company. Philadelphia, Pa.: George S. Candy, Sec. and Treas., Frankford and Southwark Passenger Railway Company; John B. Parsons, Pres., the Lombard and South Streets Passenger Railway Company; Thomas W. Ackley, Pres., Thirteenth and Fifteenth Streets Passenger Railway Company. Salem, Mass.: B. W. Russell, Pres., Salem and Danvers Street Railway Company. San Francisco, Cal.: Hon. Drury Melone, Director, City Railroad Company. Salt Lake City, Utah: Orson P. Arnold, Gen'l Manager, Salt Lake City Railway. Savannah, Ga.: George Parsons, Pres., Savannah Coast Line Railroad Company. St. Louis, Mo.: Charles Green, Pres., People's Railway Company. Wheeling, West Va.: C. A. Wingerter, Pres., Citizens' Railway Company; Michael Loftus, Supt., Citizens' Railway Company.

The report of the Executive Committee and the Treasurer's report were then read, showing the Association to be in a prosperous condition.

The proceedings of the Convention were of the greatest interest, and consisted almost wholly in the reading of the various reports of the special committees appointed at the previous Convention, and the discussion thereon. These reports were so voluminous that the entire three days were consumed in their consideration, and the various delegates abandoned the idea of indulging in excursions to points of interest and to sight-seeing generally, until the close of the session.

The first report submitted was that of the Committee on "Track Cleaning and the Removal of Snow and Ice." This report was received, and much discussion followed.

Following came reports of the special committees on "Labor and the Graduated System of Compensation," "The Completed Construction of New Road," "Stables and Care of Horses," "Electricity as a Motive Power," "The Cable System of Motive Power," and "A Uniform System of Accounts," all of which provoked lively and interesting discussion.

At the conclusion of the proceedings the following officers were elected for the ensuing year:

President—Calvin A. Richards, President, Metropolitan Railroad Company, Boston, Mass.; First Vice-president—Julius S. Walsh, President, Citizens' Railway Company, St. Louis, Mo.; Second Vice-president—Henry M. Watson, President, the Buffalo Street-Railroad Company, Buffalo, N. Y.; Third Vice-president—Edward Lusher, Sec. and Treas., the Montreal City Passenger Railway Co., Montreal, Canada; Secretary and Treasurer—William J. Richardson, Secretary, the Atlantic Avenue Railroad Co., Brooklyn, N. Y.; Executive Committee—President, Vice-presidents and William H. Hazzard, Pres., Brooklyn City Railroad Co., Brooklyn, N. Y.; James K. Lake, Supt., Chicago West-Division Railway, Chicago, Ill.; Charles J. Harrah, Pres., the People's Pass. Railway Co., Philadelphia, Pa.; William White, Pres., Dry Dock, East B. & B. R. R. Co., New York, N. Y.; B. du Pont, Pres., Central Passenger Railroad Co., Louisville, Ky.

On Friday evening, October 17th, the annual dinner of the Association was held at Delmonico's. Mr. William White, President of the Dry Dock, East Broadway and Battery R. R. Co., of this city, presided at the dinner, and he was flanked by the newly-elected and retired officers of the Association. The dinner was most elaborate, and was enlivened by toasts and responses from the gentlemen present. The party numbered over one hundred.

The next Convention will be held in St. Louis, Mo., on Wednesday, October 14th, 1885.

Reports of Special Committees.

REPORT OF COMMITTEE ON TRACK CLEANING AND THE REMOVAL OF SNOW AND ICE.

THE AMERICAN STREET-RAILWAY ASSOCIATION:—

Gentlemen—Your Committee for the consideration of "Track-cleaning and the Removal of Snow and Ice: Is Salt necessary? If so, is its Use Detrimental to the Public Health? and Especially, is it Injurious to Horses?" having duly investigated the subject, beg leave to submit the following report:

On the 25th of July, 1884, Mr. William H. Hazzard, President of the American Street-Railway Association, addressed a circular letter to the Presidents and Superintendents of all the street-railways in America, comprising a full series of questions, in relation to the propriety of the use of salt, in the cleaning of the tracks from snow and ice; and whether any better method could be suggested. The inquiry was very explicit, being intended for an exhaustive consideration of the subject; and to afford a criterion for the future policy of street-railway companies. The points to be determined relate to the necessity of the use of salt in the removing of snow and ice from the tracks, and to its healthfulness, both to the public, and to horses driven over the places where it had been employed.

This matter has been a theme of controversy for many years. It is a fact known to every tyro in science, that a mixture of snow, or ice, and salt will produce a temperature so low, as to cause the mercury in the thermometer to fall to zero, F.; and it has been plausibly argued accordingly, that the use of salt to melt the snow and ice upon the tracks of railroads in large towns would result in the withdrawal of caloric from the atmosphere, to an extent that would seriously affect the salubrity of the neighborhood, and render those of the population of a sensitive constitution, more than usually liable to contract dangerous maladies, as colds, pneumonia, pleurisy, scarlatina, diphtheria, etc. These complaints are frequent in Winter, when snow is abundant, and give importance to the conjecture. The usual increase of mortality at such times is a grave matter, and deserves the most careful scrutiny.

It has also been asserted that horses, traveling in the snow where salt has been used, are even greater sufferers. The chilliness created from the slush and melting snow disposes them, it is declared, to painful disorders of the chest, bowels, and nervous system, and induces certain complaints which, before, were hardly known. The feet are said to be specially affected. It is insisted by many that the intense cold produced in the snow in which the animals are driven, speedily benumbs and paralyzes them, and even freezes the hoof, so as often to destroy it entirely. This has been made the occasion for seeking legislative interposition to put an end to the practice of salting the streets. Nor can any man of common humane sentiments object to such a measure, if the alleged injury has occurred, or is likely to occur from this cause. It is of the greatest importance to ascertain the facts, in order to do away with whatever cruelty may be practiced in the case, and to devise any needed remedy which will avert all unnecessary interference with the passenger-transportation of this continent.

The American Street-Railway Association accordingly directed this inquiry, and appointed a Committee to conduct the investigation. Almost every individual addressed has replied, making a vast accumulation of evidence bearing directly on the subject. A synopsis of these answers may be valuable, in the way of enabling intelligent action. It need not, necessarily, be long. The conclusions, however, appear to be decidedly in favor of the free use of salt, even to a greater extent than is anywhere practiced.

In the warmer regions of the continent, little snow ever falls, and there is no incommoding experienced which requires extraordinary measures. There may also be objections when the temperature is lower than zero, as the salt will not then melt the snow or ice, but adds to the difficulty. In Quebec and Ottawa, in the Dominion of Canada, few attempts are made to remove the snow in Winter, but sleighs are put in use instead. The law requires this.

Public opinion somewhat differs in different places. Generally there has been no thought bestowed upon the matter, except by individuals connected with the street-railway companies. In several of the larger cities, there exists a prejudice against the use of salt to remove snow. It appears to have its center in the city of New York, and to radiate in those directions where the sentiment paramount there, is most influential. Mr. Henry Bergh, President of the Society for the Prevention of Cruelty to Animals, is very decidedly opposed to the use of salt in the streets, and his views are largely shared by excellent citizens. The newspapers in several instances have adopted and advocated them. The Board of Health passed an ordinance against the practice, and it has been prohibited under penalty in the new Penal Code. The same sentiment prevails in Brooklyn as in New York; some are in favor and others opposed. A like diversity of opinion exists also in Boston; and the savants and men of culture are divided like others, some contending that the use of salt in the public streets is beneficial, and others asserting the contrary. In Lowell, the objection is very strong, but appears to be steadily diminishing. The most effective argument, however, seems to have been made in New Bedford: "People who own carriages do not like it, because, when the salt comes in contact with varnish, it stains or removes it."

The testimony from other places is equally varied. In Manchester, New Hampshire, the parties are thus set forth: "People that are friendly to horse-railroads do not object to the use of salt; the others do." In Baltimore, the people are represented as opposing it, together with everything else in connection with horse-railroads except the cheap fare. In Cleveland, Ohio, the opposition appears to be general, but more decidedly among the owners of sleighs. At Toledo, there is a divided sentiment, but a majority, we are told, would not object to its "reasonable use." The only argument offered, however, is "that it is so considered in other cities," *i. e.*, detrimental to the public health when used to remove snow and ice. It is evidently only a reflected public sentiment. The same thing ought, undoubtedly, to be said in other cases.

In Philadelphia, there exists, perhaps, the greatest prejudice, anywhere known on this subject. The Board of Health added its influence; and the feeling thus created has extended to other cities of the State. The Street-Railway Companies are generally prohibited by ordinance from the use of salt on their roads. Mr. John B. Parsons, President of the Lombard and South Streets Passenger Railway Company, explains the cause of the difficulty, as follows: "We had no machinery, such as we now have, and, as a consequence, depended solely upon the use of salt to turn the snow into a slush, so that the cars could be drawn by the horses. No particular attention was paid to keeping open the inlets, so that the slush could run off from street-corners and other natural depressions in the streets. As a consequence, the street-crossings were almost impassable, and much complaint came from the citizens. Many diseases were attributed to its use, and public clamor became so loud that the Councils passed ordinances limiting its use to certain portions of the city, and prohibiting its use in other portions, under a heavy penalty."

Many physicians, however, gave their judgment at the time, that salt was not detrimental, and the general opinion is beginning to change. The public journals of the city are now speaking approvingly of the use of salt, and the companies are beginning to use it again.

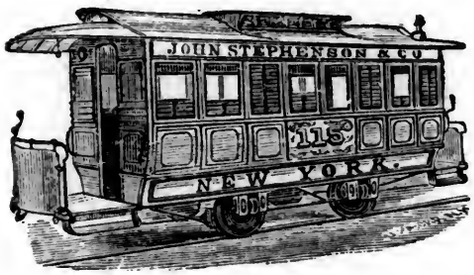
There is a strong prejudice against its use in Reading, which is ascribed to the influence of the excitement in Philadelphia; still salt is used, but the fact is not admitted. In Pittsburgh, there has been talk of applying to the Legislature for a prohibitory statute, on the ground that it spoils the fine "finish" on carriage-wheels. Nevertheless, all vehicles seek the railway-track in preference, because it is always open. The only opposition to the use of salt upon which the public seem to agree, is that it benefits a corporation. The majority favor its employment.

In the other parts of the country where street-railways abound and snow is abundant in Winter, public sentiment appears to be generally unanimous in favor of the use of salt, because of the facilities which it gives in clearing away a most formidable obstruction to travel. No other method is known which would be more practical, more economical and more satisfactory. The only thing suggested is a sweeping-machine combining a boiler, to which the snow may be carried and melted. This, it seems, can hardly be feasible, and even though it were, the same objections on the score of slush and detriment to health would exist, and to a much greater extent.

The testimony appears to be unanimous, so far as relates to the entire absence of injury to the animals employed. No precautions are used to protect their health, yet no disease has been observed, which might have been occasioned by the exposure. No special care seems to have been taken of those that traveled in the salt mixture, beyond rubbing them off when taken from the cars to the stables. The inquiries were very explicit; relating to the effect on the nervous system, the general health, the effect on the feet, legs and bellies, the shell or lamina of the feet, and the frog or soft part of the foot; and the answers were unequivocal, that no perceptible injury or hurt had been noticed. One correspondent had noticed "scratches," and another mentioned the possibility of harm from too long exposure. Another, however, was of opinion that the effect of the salt on the animals had been decidedly wholesome in regard to health of limbs and body. Indeed, Messrs. Haller, Beck & Co., of the Union Salt Works, at Allegheny City, declare that during twenty years they have used from 25 to 30 horses, and never had any trouble on account of the salt. They never had a horse afflicted either with thrush or "scratches." Their animals, they consider, are as fine as any in the city. The salt seemed to have been salutary to them. Another advantage was generally noticed. The slipping and straining so common in slippery roadways was far less frequent

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where the snow and ice had been so removed. Less than half the number of slips and falls were estimated to occur.

No other method known is so cheap or efficient for the purpose. One or two companies use ashes when the coating of ice is thin, but the result is hardly satisfactory. In Philadelphia, the tracks are cleared by scraping, but at large cost. One company in Ohio used a heavy iron scraper, procured in Detroit, to clear the ice from the rails, but it did not give satisfaction. It is for this purpose that the salt is more generally employed. Many companies use it in no other case, but depend on snow-plows and shovcling; but the inference is unavoidable, that if they were prohibited entirely, the street-railways in the northern cities of the Union would be impassable many weeks in each Winter.

Careful examination has also shown that there is no ground whatever for apprehension in regard to the public health from this cause. There has been no epidemic or prevalent disorder set in operation or aggravated anywhere by the use of salt on thoroughfares. The rate of mortality has exhibited no alarming increase, nor does this appear to have been anywhere suspected. All complaint is confined to what *may* occur—some possible or hypothetical result. The slush and pools of water that are liable to be formed at low points in the streets or at the crossings, making pedestrianism unpleasant, and the injury to the paint and varnish on wheeled carriages, constitute all the well-supported ground of complaint. It would not be difficult to obviate these, and it ought to be done. The fault lies, however, with the municipal authorities, who have been remiss in regard to furnishing the proper facilities for drainage.

Observations carefully made with the thermometer show that the mixing of salt with snow in the streets makes no perceptible change of temperature. It is no colder in the thoroughfares where it is done, than in others at a distance. This is the only objection which has a plausible foundation scientifically, and it appears to be utterly fallacious.

In conclusion, therefore, the Committee find that the use of salt for the removal of ice and snow from the railway-track, to be an imperative necessity; and that there exists no reasonable cause for apprehension of injury or detriment to the public health, or to the health and physical comfort of the animals employed. What objections really exist are easily removed, while the advantages are indisputable.

Indeed, it is evident that the weight of evidence, as well as argument, is on the other side. The removal of snow from the streets is a problem that has taxed the ingenuity of public officials in several of our large cities. Hundreds of thousands of dollars have been expended in New York for carting it away to the rivers, and yet it was found impossible to accomplish more than to clear the more public thoroughfares. It would have been a far greater economy, if the City Government had, instead, caused all the streets to be copiously salted during the snow-storms, and taken efficient measures at the same time to drain the brine and slush immediately into the sewers. We trust that this subject will be taken into consideration at an early day.

The public health, so far from being injuriously affected, will be promoted by the free use of salt in such a way. The brine flowing into the sewers will, in a great degree, prevent the decomposition of the various refuse materials which are deposited there from the houses above; and, as a direct result, the formation and disengagement of sewer-gas would be arrested, and its discharge into the living apartments consequently prevented. This alone would be a work of sanitation, of which too great an account can hardly be made.

At the present time, the exhalations from fermenting matter in the streets are an active cause of mischief. The air is poisoned, and many of the population, if not made ill outright, suffer, nevertheless, from depressed nervous conditions, and lowered vitality. The squalor and misery endured by the inmates of tenement-houses and other abodes of poverty may thus be rationally accounted for. If some provision could be made for preventing this decomposition of refuse matter in the streets, the salutary effect upon the public health would be immediately perceivable. The utility of salt for this purpose is apparent. If it could be applied at stated periods during the warm season, these benefits would be assured.

The accumulation of snow and refuse of all kinds, which occurs every Winter in many streets, has been frequently remarked. Every warm day the filthy mixture is thawed and more thoroughly compounded, while its noisome effluvia contaminate the air. This process usually continues till Spring has advanced several weeks, and we are often fortunate if the festering mass is removed before the hot days of Summer. It is easy to see how all this would be prevented, if the authorities would take the matter into their own hands, and instead of limiting, discouraging, and prohibiting the use of salt to clear off snow and ice, would employ it freely both for that purpose and to sweeten the atmosphere. The action taken by Boards of Health in the matter shows rather a conforming to ignorant prejudice, than a proper and intelligent comprehension of the facts. A little scientific knowledge would go far toward the silencing of the clamor.

It is plain enough that the antiseptic virtues of salt are patent above those of many popular disinfectants in the way of purifying the air. The salubrity of New York is largely to be attributed to the saline elements derived by the atmosphere from the salt water that surrounds it on every side. The analogy must hold good in regard to the same agencies artificially supplied in the manner indicated.

The objections, which have been repeatedly offered in various quarters to the use of salt by the street-railway companies, it will be seen, are not tenable. The more abundant use of it for the purposes in question would be fully justified. Instead of the burden and expense failing entirely upon them, as is now the case, the public ought to bear a reasonable proportion. We would all be the gainers by the convenience afforded from the speedy removal of the great mass of snow, and in addition, by the increased salubrity of the atmosphere. It is in every way advantageous, and to this conclusion, the good sense of our people must eventually arrive.

A. B. Whitney, M. D.,
Joab Mulvane,
Wm. Hagenswiler. } *Committee.*

REPORT OF COMMITTEE ON LABOR AND THE GRADUATED SYSTEM OF COMPENSATION.

Gentlemen:—Your committee on "Labor and the Graduated System of Compensation," beg leave to report as follows:

The labor system of street-railway companies has this peculiarity, viz.: it is intimately connected with metropolitan society, and is, consequently, much exposed to disturbing influences; it is also distinguished by the fact, that the entire income of the corporation is collected in small amounts by a numerous set of employés. These features render its regulation a matter of considerable perplexity, and make it all the more important that it should be systematized on simple, practical principles. Street-railways are public carriers running through dense populations, their relations to the public being determined in a large measure by their employés. Hence it is. that at the outset of an inquiry as to the best means of regulating their labor system, arises the obvious necessity for mutual good-will between the companies and the labor they control.

In the acquisition of experience in managing street-railways, and in closely watching the details of their operation, the stronger is our conviction that the best guarantee of the labor employed lies in the fidelity, competency and honesty of the men, rather than in any ingenuity of mechanical checks, or other protective or detective arrangements.

This conclusion may be regarded more as a sentiment than a safe rule of business, and others may question the practical economy of a proposition that savors of sentiment alone, than an enforcement of faithful service by arbitrary methods. From a purely business standpoint. it is true of all forms in which invested capital depends for returns on regular continuous labor, that to awake in the employés an interest in their duties and a personal friendship towards the corporation employing them, is the best basis for permanent profits. The moral average of men is as yet unknown, and wherever a large force is employed, there will always be found a certain percentage of disloyalty, duplicity and dishonesty.

To expect to find in artificial devices a complete substitute for personal honesty or for faithful services willingly rendered is fallacious; and we must look farther and sink deeper.

All appointments to positions should be made from that class which would dignify labor, and avoided from that class, which by habit, training or education are suited to higher avocations; and in no case should any device for safeguard in handling money be used that will blunt moral sensibilities.

The employés of railway corporations cannot properly be classified under the head of "skilled labor" The capital invested and its returns is largely at the mercy of the employés, and in few corporations does loss of money more immediately result from inefficient or wasteful labor, or profit more quickly accrue from intelligent and consientious effort, than in street-car companies. But, nevertheless, the services exacted from conductors, drivers and stablemen are not of such a character as to require an apprenticeship to understand. Any man of average intelligence can discharge the duties, and, although he may not be at first as efficient as an old hand, yet a few days, if he be industrious and attentive, will give all the experience that is really necessary. It is, therefore, unwise for them to represent themselves as skilled workmen, or to allow themselves to fall into the pernicious notion that they are as indispensable to their employers, and as difficult to replace as the craftsmen in specified trades and manufactures. In presenting this view, it is only for the purpose of more forcibly referring to the vital importance of managing and directing the labor system. Unless employés of lines are faithful, energetic and economical, it is impossible to obtain substantial success. The neglect or abuse of stock or the running-gear of cars, the waste of feed, carelessness or insolence towards the public, and indifference or dishonesty in the collection of fares, are all means by which employés can impair the operations and entail losses upon these corporations.

To fully guard all these openings, to establish a system of checks by which fraud or negligence can be detected or prevented, is, we are fully persuaded, almost impossible.

A corporation is an artificial person, existing only in the contemplation of law, but this does not deprive it of a certain individualism; and the employers are governed by a distinctive spirit, that in turn regulates their feeling of the service towards it. Sometimes that spirit is harsh, arbitrary and exacting; sometimes loose and improvident; sometimes strict in the

enforcement of rules, but tempered with justice and moderation. Whatever it may be, the employés know it, and their services take color from it; and it is highly important that they should have a clear and definite understanding of the estimate placed on their labor. They should be taught in the first place, that the management does not regard them as skilled workmen; that a "strike" may interrupt, but can in no way stop operations; that if they were all to resign on the same day the company could go ahead the following, not perhaps satisfactorily, but sufficiently so to maintain business, and that but a short time would suffice to oblierate all effects of the interruption. While insisting upon this general feature respecting labor, the men should be made to feel that, if they are not classified as representing skilled labor, neither are they on the other hand regarded as regular day-laborers; that good judgment, promptitude and experience are fully appreciated; that the managements intend and aim to reward fidelity, and that as long as they are trustworthy, they are sure of their places, and that continued conscientious service will be recognized. Promising these general views, there remains to be noticed what in our opinion are the best means of producing the relations mentioned as most desirable.

It should be a settled principle that discharges as far as possible shall not be capricious or without cause, and that promotions will be made on the basis of length of service and personal merit. The labor system of an ordinary line is not sufficiently varied or extensive to embrace a regular scale of promotions, but the principle should be recognized and established, that the management is influenced by the relative merits of their employés; that there is no favoritism tolerated, and that a fathful and efficient man will not be overlooked or unfairly treated. When the men are educated to understand this, an *esprit du corps* will gradually spring up and a guarantee of good work secured, obtainable in no other way. In enforcing a system of fair promotions and a strictly equitable treatment of labor, much dependence must, necessarily, be placed upon the reports of other officers. It is, therefore, of essential importance that they should be honorable and just men, as well as energetic and vigilant, and that their reports should be reviewed carefully by the chief executive officer, through whose individuality flows the inspiration of management.

A graduated system of compensation, regulated according to length of service and general efficiency, would also, if judiciously introduced, be productive of beneficial results. Such a system could not be created summarily, but by establishing conditions as to the filling of vacancies and fixing a lower rate of pay for new appointees, and the terms upon which their advancement will take place, a complete system may soon be created, the features of which can be adjusted to suit the particular circumstances surrounding the operation of each particular line. A man who possesses experience, and whom the company has tested and found reliable and competent, is certainly worth more wages than a comparatively new appointee. His services are more pecuniarily profitable, and there is a corresponding loss when a new man is placed upon the same footing.

A graduated system of compensation should be based upon a permanent and well-known classification of the men, and by this means there might be, if desirable, a saving of wages and a better recognition of individual merit and demerit. The system once established would tend to promote fidelity and self-respect among the employés; seeing its justice they would coöperate in its maintenance; and at the same time it would improve the relation of capital and labor and give to the men a stronger personal interest in the permanency of their employment.

The use of all kind of registers and other detective arrangements and contrivances simply expresses distrust; all of them represent the same efforts of experience and ingenuity to devise a substitute for personal honesty; all of them are imperfect and irritating, tending to blunt moral sensibilities and foster want of confidence.

It is undoubtedly true that these devices cannot be dispensed with under the conditions that now exist, and the views here expressed have reference rather to general principles of the regulations of labor, than to the details of detective measures; yet we cannot fail to see in their introduction a great disturbing element. We will not, therefore, discuss the relative values of the various contrivances, but insist that were it an established fact that these artificial means were indispensable, yet, even then, the principles herein set forth ought to control the labor system of street-railways. The losses incurred by strikes, from which we have not been exempt, the ceaseless discussion of the relation between labor and capital, incident to modern times; and the increasing sensitiveness of capital to social disquiet, all unmistakably suggest, that, so far as possible, corporations employing large forces of men should ground their policy on equity, and avoid unnecessary antagonisms and consequent hostile legislation. We owe this duty to society, and we owe it to the large interests confided to our charge. It may be impossible to prevent occasional disputes, but when they arise, we should not be found evidently in the wrong, and bear the stigma of oppressing labor, or of neglecting wise and just rules for its employment and control.

We feel assured that the application of principles herein indicated will not increase the expense of operation, and will remove much of the anxiety and difficulty connected with the management of street-railways.

We recommend no sudden and sweeping changes, because the labor system supporting all industrial investments of capital cannot be summarily altered without confusion or loss. It crystalizes in fixed forms with the passage of years; and changes, even for improvement, should be gradually introduced.

In conclusion, we recommend that the principles of management we have briefly outlined, should be steadily held in view in the treatment of labor, and so far as possible incorporated in the practical operation of railway lines. Respectfully submitted,

JULIUS S. WALSH,
JACOB REHM,
HARVEY N. ROWE. } *Committee.*

The following letter was submitted as a part of the report of the committee:

OFFICE OF THE NORTH CHICAGO CITY RAILWAY COMPANY,
CHICAGO, October 10th, 1884.

WM. H. HAZZARD, Esq., President American Street-Railway Association, Brooklyn, N. Y.

Dear Sir—Having been appointed by you as an associate member of the committee on "Labor and the Graduating System of Compensation," (as refers to labor employed by street-railway companies), I beg leave to report the following on the subject:

For several years our company has divided all of its drivers and conductors into four classes or grades, as experienced hands are of more value to the company than those just entering our service. We require every man in our employ to remain for the space of two months in the first class, receiving a compensation of $1.50 per diem. After the expiration of two months he enters the second class or grade, remaining therein for four months, receiving a salary of $1.75 daily for his services. After the expiration of the last-named four months, he advances into the third class or grade, remaining therein six months, and receiving the sum of $2.00 as a daily compensation for his labor. Having thus served our company for the space of twelve months, and having become thoroughly acquainted with the duties to be performed by him, and fully able to discharge them intelligently, the laborer enters the fourth class, and his wages are advanced to $2.25, which is a higher sum than any laboring man can earn.

The graduated system of compensation works well with us here, and makes "strikes" an impossibility. No honest and intelligent laborer will "strike" for higher wages, when he knows that by serving through a regular course, he will attain what he cannot possibly get anywhere else.

Any laboring man who enters our service and has been with us for two months is only too anxious to stay, because his wages will be increased for the coming four months. In short, the longer they stay the better is their pay.

Furthermore, this system furnishes us a reliable and trustworthy set of workmen, because the longer they stay the more efficient they become in the discharge of their several duties. Such a wage system secures to us steady and punctual men, who perform their work more cheerfully because they know that their value is acknowledged by the company, which remunerates them for their services with the highest possible wages.

This system of graduating the wages works well here with us. It works somewhat after the manner of a school of probation. After the men have worked through it, they find it to their interest to remain with us. We have all reason to be satisfied with the system, having by it secured a lot of good, steady and reliable men, who generally stay unless discharged for cause. The average hours per man per day is 11½ hours. I have the honor to be, Your obedient servant,

JACOB REHM,
Vice-president, North Chicago City Railway Co.

REPORT OF COMMITTEE ON COMPLETED CONSTRUCTION OF NEW ROAD.

NEW YORK, October 15th, 1884.

Report of the Committee on "Completed Construction of New Road."

In the construction of street-railways, it is evident that while we must endeavor to get the best roadway for the cars, due regard must be paid to the requirements of the general travel, and to the local laws governing the form of rail and other details; so that we are not at liberty to use the best means to accomplish the end desired. In fact, the matter is often so hampered with municipal regulations that it is impossible to accomplish more than an imperfect and unsatisfactory solution of the question.

The best form of rail for the purposes of the railway company alone is, undoubtedly, the "center-bearing," as the weight of the car-wheel in this case bears directly upon the center of the rail and is transmitted evenly to the center of the stringer, so that the track is in the best position to resist the outward pressure which is constantly tending to widen its gauge, and otherwise injure its condition. The spikes with this form are placed alternately on either side of the head, so that the rail, besides having a better bearing on the timber as above stated, is held down equally on both sides. The car-wheels run more smoothly and with less friction than upon any other form, as there can be no possible contact with any paving stones, and the open space provided on the outside has a tendency to keep the head of the rail free from dirt and grit. This is especially the case during cold weather, when one of the most serious difficulties in operating street-rail-

ways arises from frozen mud, ice or snow getting upon the rails, even when the greatest care is taken to keep the track clear. The center-bearing is the standard street rail now in use in New York City, and it is used to a considerable extent in Brooklyn and a few other places.

In the next form, known as the "slope-back," the bearing is approximately in the center, the head being about three inches wide, and beveled or sloped off on the outer edge, so that, to a certain extent, it gives the advantages above enumerated for the center-bearing rail, but only to a limited degree.

The "side-bearing" pattern, with its many variations, is that which is most generally in use in the United States; not because it is the best, but because it is the best that the railway companies are permitted to put down, as wagon wheels can readily get on the track, and it gives a good wide tramway for general travel. This very fact however, is a great detriment, as the general traffic is invited by its smoothness and other advantages to run upon it. Heavy teams going at a slow rate are constantly in the way of the faster moving cars, and the rails are not only worn out by this travel, but the speed of the cars and the general business of the road interfered with. A very serious objection to all side-bearing forms is that the weight of the cars being entirely on the outer side, that part of the rail wears into the stringer sooner than the other, causing the rail to roll out of level and to widen the gauge of the track. All forms in which the head of the rail is narrower than the tread of the car-wheel should be avoided, as the wearing surface is too little, and in the side-bearing patterns this is especially the case, for unless the head is as wide as the tread the projecting edge of the wheel will be constantly striking against the paving stones outside of the rail when the track is new, or the pavement is relaid. This will only cease when the paving-stones shall have been gradually worn away by the action of the wheels, which is a very objectionable and costly process, or when they shall have been knocked down or otherwise settled below the head of the rail.

Your committee would, therefore, recommend the adoption of the center-bearing form of rail in all cases that it will be allowed by the local authorities, especially where the streets or avenues are wide enough to provide the general travel of the street with a good and sufficient roadway, outside of the space occupied by the railway.

Where the service is heavy, a rail weighing sixty pounds to the yard will be found the most satisfactory and in the end the most economical; but upon roads with lighter travel this is not necessary, though it should always be borne in mind that it is impossible to get satisfactory results when materials of poor quality or insufficient size or weight are used. It is not the first cost that should be regarded altogether, for if the railway is well-built with good and sufficient materials the annual wear and tear will be proportionately reduced, so that the profit and loss account from year to year will not be charged with constant repairs rendered needful by poor or scanty construction at the outset.

The spike-holes should be about twelve inches apart, so that when the rails are first laid it will be enough to spike every alternate hole, thus leaving new holes with their original countersink to be used when the others shall have become worn too large and be unfit to retain the spikes. The rails should be carefully inspected, and any that are not cut square at the ends or not straight and level should be rejected and returned to the mill.

As the gauge of street-railways is almost always established by the local authorities to conform with the legal gauge of the ordinary vehicles of such city, there is in consequence no universal or standard gauge for them. Your committee is, however, of the opinion that from four feet eight inches to five feet two inches gauge, will give the most satisfactory results as a general rule.

Where double tracks are laid, there should be ample space for the cars to pass each other on both the straight tracks and the curves without danger of striking. Five feet between gauge-lines, unless the cars are exceptionally large and wide, will be a sufficient distance; and with straight tracks it will also allow a man to stand between the cars while passing each other, which may prevent many accidents.

All joints of the rails should have rolled iron joint-plates not less than eighteen inches long, placed under them. These should have vertical flanges to fit against the sides of the rails, so as to keep them in line with each other and to increase the vertical strength of the joint-plate itself. If the track is laid in cold weather, the joints of the rails should be kept apart three-eighths of an inch to allow for expansion of the rails in Summer, and this space should be less when the rails are laid, as the temperature rises, although the ends of the rails should never be laid less than one-eighth of an inch apart even in mid-day of the very hottest weather.

The rail-spikes should be five and a half or six inches long, of one-half inch square iron, with countersink heads, to fit into and not project above the countersink in the rail itself. They should be of good, tough iron, so that when driven, the heads will not fly off under the strokes of the hammer.

As street-railways are now usually constructed, the rails are placed upon longitudinal wooden stringers, resting upon transverse wooden cross-ties. Where it can be obtained at a reasonable cost, your committee recommends the use of yellow pine, free from sap-growth, and cut from trees that have not been tapped. As a general rule, the best yellow pine railroad lumber is brought from Georgia or Florida, and in all cities near the seaboard, at least, the rate of freight is low enough to justify its use for stringers and cross-ties. Of course, this may not be so in cities or towns far inland, and in such cases, other lumber must be used which can be more conveniently and reasonably obtained. The ties should be of equal size, in order to give a uniform bearing and support to the track; for if they are of unequal surface, the track will be better held up by the large ties than the smaller ones, thus causing it to be uneven and irregular. For the same reason, they should be placed at a uniform distance apart, five feet from center to center, being probably the most desirable. Uniformity of dimensions can be more certainly had if the ties are sawed than if hewed, and in addition to this the stringers will then always have a good flat bearing upon them. The joints of the stringers should never be under the joints of the rails. The stringers should not be less than seven inches deep, and of the same width as the rail which is to lie upon them, unless it should be one of the narrow forms of rail, in which case the timber should project on both sides not more, however, than one-half inch. It should then be beveled off on the upper edges to the width of the rail before putting down the pavement. The stringers should be, at least, twenty-five feet long, in lengths divisible by five feet, so that there will be no waste in cutting off useless ends to allow the joints of the stringers to come exactly upon the cross-ties. Of course where there is exceptionally heavy service, it may be of advantage to place the ties four feet from center to center, and the size of the ties may then be increased to advantage, say five inches high by seven inches wide, although generally four inches by six inches is large enough. The ties should project outside of the stringers on both sides at least nine inches, and the stringers on the outside should be fastened to the ties by cast-iron knees not less than six inches high and six inches long, and on the inside by similar knees three inches high and three inches long. The long knees on the outside tend to keep the stringer in a perpendicular position and so to preserve the gauge of the track; for tracks never get narrower, all the conditions of their use tending to press them outwards and to widen the gauge. At all joints of stringers, joint-knees should be used on both the inside and outside of the stringers, and they should be broad enough to bear against and be spiked to the contiguous ends of the same, thus keeping them in line. The spikes used for these cast-iron knees should be three and a half or four inches long, and three-eighths of an inch square, with button-heads. The knees should be of good, strong iron, so as not to break easily, in case the workman should miss the spike and accidentally hit the knee itself, and all the spike-holes should be carefully drifted out, so that in driving the knee-spikes, they will not wedge in the holes and split the knee.

It is very important to have the ties and stringers well and solidly tamped-up, and a straight line and even surface carefully obtained. This is a matter which is often slighted, but which should be attended to with great care.

A very troublesome and expensive item of repairs is often caused by the wheels of heavy wagons making ruts alongside of the rails, thus causing the track to get out of gauge, and otherwise wrenching and injuring it. This can be, in a great measure, prevented by putting a row of substantial square-shaped paving-blocks on each side of each rail, which, after being thoroughly rammed, should be left about one-half inch above the rail, otherwise they will settle down so as to be below the rail, when their efficiency will be greatly lessened.

All the undisturbed bed between the cross-ties should be loosened up with the pickaxe, so that all of the pavement shall have the same bearing, and it will settle alike all over.

The best pavement for the horse path is probably had by using cobble-stones about six inches long, about four inches wide and two or three inches thick. These dimensions give stones of moderate size, and of flat, oval form, so that when closely set on end they furnish a very good foothold for the horses, and the pavement can be kept in repair with a very reasonable cost. The horse path should be paved as nearly as possible level, and all crowning or elevation in the middle of the track should be avoided, so as to allow the horses' feet to travel evenly and squarely. The stones should be laid upon a bed of good, sharp gravel or coarse sand six inches deep; they should be thoroughly rammed three times, and left with a covering of the same material about one-half inch deep, from which all stones over an inch long should be raked off.

At proper and frequent intervals, suitable connections should be made with the sewers or with surface drains where sewers are not in use. If this matter is not properly attended to, great inconvenience and expense will be caused, especially in cities where the melting of snow during Winter causes a great accumulation of water upon the track which, if not promptly removed, may, by a sudden change of weather freeze up solid on the track. In any event, no track can be properly kept in order unless the surplus water is promptly and adequately drained off. The general elevation of the whole track should be a little higher than the rest of the street, to aid in draining the water away from the track.

The radius of the curves will be governed by the width of the streets and other conditions, but it is always desirable to avoid curves of small radius. A curve of fifty or sixty feet radius is probably the most desirable when it can be laid down, but in many cities the width of the streets will not per-

mit curves of more than thirty or thirty-five feet radius, which, however, if properly laid, will give all reasonable satisfaction. The curved rails should be of the grooved form on both the inside and outside lines of the curve, although in curves of large radius it is not necessary to have the outer line laid with grooved rail; in such cases bending the rail used upon the rest of the track to proper shape. The groove should be about one and a half inches wide, and the inner side or guard of the grooved rail should not be more than three-eighths of an inch above the tread. Great care should be taken in laying the curves to have them of regular curvature, uniform gauge, and with no abrupt changes of surface. Ordinarily, a curve laid with the inner and outer rails on the same level will give the best results in service, but there are instances when, from the grade of the streets it will be found necessary to elevate one rail higher than the other. The outer rail may then be elevated a few inches above the inner without any disadvantage, and possibly in some cases to advantage; but the inner rail should never be higher than the outer if it can possibly be avoided, although a slight difference in this respect, where absolutely unavoidable, can be allowed, if the curve is very carefully and accurately laid down. The curves should always be so constructed and laid down that all four wheels of the car will bear equally upon the rails; as otherwise, if any one of the wheels should have its portion of the load removed from it by reason of a depression in the track, it will have a tendency to run off the curve at that point. The curved rails should be, when practicable, in lengths of thirty feet, so as to have as few joints as possible, and a straight guard-rail not less than seven feet long should be attached to each end of the inner line of the curve.

On single-track railways where it is necessary to have turnouts or passing places, they should be so constructed as to allow the cars to run easily into and out of the turnout. This can be accomplished by making the curves leading into and out of the turnouts of large radius, say three hundred or three hundred and fifty feet. As, however, in cities the length required for this form of turnout is often inadmissible, it will then be necessary to use curves of shorter radius, and a turnout with grooved rails of seventy-five feet radius will probably be found the most desirable under such circumstances. Where the curved rails of the turnout are of three hundred or three hundred and fifty feet radius it will not be necessary to use any grooved rails, as the ordinary rails when carefuily curved, will be sufficient to guide the car wheels.

The castings for all switches, frogs, and crossings should be made from hard, tough iron, and of substantial size and weight. At each end of the casting there should be a recess or pocket of the right size and shape to support and retain in position the end of the adjoining rail; or, when two castings themselves abut together, the end on to which the cars run should rest in a pocket formed in the end of the other casting. Particular care should be taken to have all castings evenly and solidly bedded upon the timber supporting them, for otherwise they are liable to be broken by the shocks and strains of heavy loads crossing over them. At places where frogs or crossings are required and one of the tracks is used very much less than the other, it will often be found desirable to have the castings so made, as to allow a continuous rail to run through a recess in the casting, thus giving an unbroken rail to that one of the tracks which has much the greater travel, while the occasional cars running on the other track have their wheels so raised up that their flanges pass readily over the top of the continuous rail. "Toe-pieces," or slight projections, should be made on all castings, when, by the size or smoothness of the surfaces exposed, horses are otherwise liable to slip upon them, smooth spaces being left only where the car-wheels run.

The use of turn-tables should, wherever it is possible, be avoided, but as they will often be found necessary, it is important that those only should be used which will turn easily, present little or no obstruction in the street, and require but a reasonable amount of repairs when in use. They should be set on brick or stone foundations laid below the frost-line, and they should be thoroughly provided with drainage.

Within a recent period, and especially within the last five years, a very radical change has taken place in the manufacture of rails, whether for steam or horse-railroads; the material now used in the construction or repair of railways being almost universally steel instead of iron; in fact it is now very difficult to get iron rails, as the mills that formerly made them have mostly gone out of the business, or have changed their plant to make steel rails instead. The improvements in the manufacture of steel have been so great that there is now no inducement to use the inferior article, as the superior can be had at the same or a less price. The service of steel rails on an average street-railway is, probably, at least three times that of iron rails of equal size and weight, the wear of the steel rails being also more even and regular. One great cause of the rapid deterioration of iron rails furnished for street-railway use, arose from the fact that they would laminate and often split off in pieces of considerable size, so that the surfaces were not only worn away, but actually broken away and splintered off. Steel rails, on the contrary, being of homogeneous and tough material, are not subject to this objection, every particle that is worn off under service coming away by itself, but not dragging with it any other portion of the mass.

Before closing, we must not omit to refer to the various forms of girder-rails introduced within the last few years to a considerable extent, by which wooden stringers are altogether avoided. One great advantage that they give is that a perfectly secure and level joint can be had at the ends of the rails, as fish-plate joints can be used, similar in general character to those in use on steam-railroads. The deterioration of the roadway by reason of the decay and wearing away of the stringers under the rails is avoided, as no timber is used with them, excepting for cross-ties, and these are so far underground as to last a very much longer time than the stringers would last, not being exposed as they are to the constant changes of temperature and of moisture and dryness. It is quite possible that the standard street-railway of the near future will be constructed with steel girder rails set on iron or steel cross-ties, and held to gauge by iron tie-rods.

No reference is made in this report to the construction of cable-railways, as that whole subject is comparatively new, and no special system of construction for such railways can as yet be regarded as being proved to be the most desirable one.

WM. WHARTON, JR., *Chairman of Committee*,
President of Cape May and Schellenger's Landing R. R. Co.,
Cape May, N. J.

NEW YORK, October 15, 1884.

(The remaining reports of Special Committees will appear in the next issue of the JOURNAL.)

An Improvement for Cable Roads.

ACCORDING to the San Francisco *Call*, a mechanical engineer of that city has invented and patented a plan for dispensing with the necessity of depressions in the street grades at points where cable roads intersect each other. At present when a car is approaching the crossing of another cable road the man in charge of the dummy that is drawn by the under cable has to let it go some distance before he arrives at the crossing, and take it up again at the same distance on the other side. As this distance is too great for the car and dummy to be carried by their own momentum, a depression in the grade has been made to accelerate their movement after the cable is dropped sufficiently to carry them to the point beyond where it is to be picked up again. The invention referred to enables the man at the grip to hold on to the cable until his car is so near the intersecting road that its momentum will carry it to where the grip can seize its hold again without interfering at all with the grade of the street.

STREET-RAILWAY NOTES.

THE Kansas City Cable Railroad will open for business next month. It is 1¼ miles long, connecting the business center of the city with the summit of the bluffs and saving travelers from twenty to thirty minutes of travel. The road was begun a little over a year ago, and has cost about $300,000. A majority of the stock is owned in Boston, where it is valued at $112 per share. The promoters expect it to prove a profitable investment.

THE St. Paul & Minneapolis Elevated Railway Company directors have elected the following officers: President, J. H. Drake; vice-president, J. B. Bassett; secretary, O. F. Sherwood; treasurer, Albert Shaeffer.

IN the department of New Inventions of the JOURNAL this month, is published the description of a safety car-gate designed for use on street-cars.

BERLIN oculists report that the iron dust floating from elevated railways in streets has added five per cent. to the profits of the profession.

THE Rome Street-Railway Company, of Rome, Ga., will soon commence building their road.

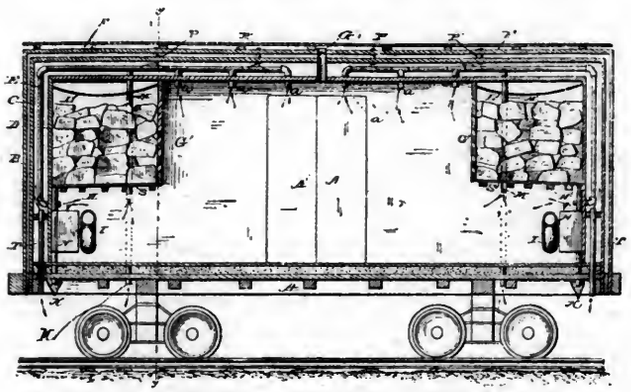
A SYSTEM of "penny fares" has recently been intoduced upon the street-railways of Dublin, Ireland.

New Inventions.

Baumgardner's Refrigerator-car.

NEWTON L. BAUMGARDNER, of Wooster, O., has invented a refrigerator-car, which is herewith illustrated and described. It is claimed by the inventor that heretofore in the construction of such cars, warm and vitiated air accumulates at the top of the packing department, thus causing loss of cargo; and, that upon the principle that cold air is heavier than hot, he obviates the difficulty of uneven temperature by an arrangement of cold air circulating pipes.

The design of the car is to convey perishable cargo by railway, and to keep it in a fresh, preserved state while in transit and at stoppage points along the route, and to economize in the consumption of ice.



BAUMGARDNER'S REFRIGERATOR-CAR.

The accompanying cut shows a longitudinal interior view of the car. The object of the invention is accomplished by the combination of the pipes E, which conduct the cooled air as it is discharged from the ice-boxes by means of the pipes M, up the ends and along the top of the car where it is discharged into the car by the pipes *a a*, whence it circulates and descends among the cargo. At the same time fresh outer atmosphere is admitted into the bottom of the car through the lower ports of the pipes M, the vitiated air passing up the pipes G, and discharging at the pipes *p' p'*, in the channel F, formed by the running-board. By the escape of the vitiated air through the flap-valve pipes G, and the fresh air entering at the pipes M, to take its place, a circulation of cold air from the ice-boxes is induced through the pipes E.

Again, to aid this circulation of cooled and fresh air, air-agitators are furnished, consisting of an encased fan-blower I, which admits air at the center of the casing at a shaft on which a blower-wheel is rigidly fastened. The running of the wheel forces the air out of the rim of the casing through a pipe into the car. The blower-wheel, or fan, is to be operated at intervals, or continuously, by means of an automatic mechanical device placed in the box N. The fan can be worked when the car is at rest to great advantage.

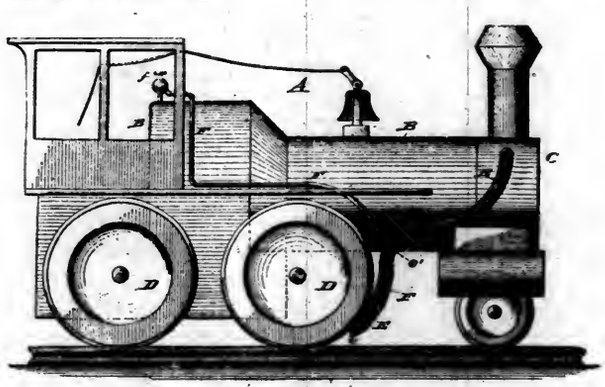
The ice-boxes are composed of a perforated side G, and a solid flooring S, and are drained by the pipe H, into a subjacent trough K. The ice-boxes are accessible through doors in the sides of the car. They are provided with a perforated partition in their upper portion.

The floor, or bottom of the car is composed of two layers of planking separated by a non-conducting filling, preferably charcoal. The outer body B, and the inner partitions C and D, are mounted upon the bottom A. No communication exists between the space included between the car-body and the partition C, and the external atmosphere or the interior of the car, the space being a non-conducting dead-air space. The car-body is surmounted by a three-sided channel F, open at both ends, from which pipes *p p*, enter the space between the walls C and D. The pipe T, supplies outer atmosphere to the dead-air space.

By this combination the inventor claims that he has produced a refrigerator-car complete in all the parts desired for the purposes for which it is intended, and that by it a minimum quantity of ice is consumed and a greater amount of perishable cargo will be preserved than by other cars for a similar purpose. He also claims that his combination can be applied to refrigerator-buildings with the same success.

Johnson's Improvement in Locomotives.

MADISON L. JOHNSON, of Galena, Ill., has invented an improvement in the construction of locomotives which is illustrated in the accompanying cut. The object of the invention is to prevent locomotive driving-wheels from slipping or spinning.



JOHNSON'S IMPROVEMENT IN LOCOMOTIVES.

The cut gives a side view of the locomotive with the improvement attachment. A represents a locomotive-engine, of which B is the boiler, C the smoke-box, and D D the driving-wheels. E is a pipe which is inserted in the upper or other proper part of the smoke-box C, and, running to the rear, curves outward and downward to the vicinity of the lower part of the driving-wheel D. The exit *e* of this pipe is so constructed and placed in regard to the wheel that when the blast is in operation the particles of smoke and other matters from the smoke-box are driven out of the exit and forced against the surface of the tire, whence they are deflected between the tire and the rail. *e'* is a proper bend in the pipe E, for the insertion of the steam-pipe. F is the steam-pipe, rising from the dome or other proper part of the boiler B, and controlled by the valve *f*. The pipe F runs forward, and, curving outward and downward, enters the smoke-pipe at the bend *e'*, where, in conjunction with the pipe, it forms a blower, being of much less diameter than the pipe E.

The operation of the apparatus is as follows: When the wheels are found to be slipping, the engineer opens the

valve *f*, admitting a jet of steam into the pipe E. Then, of course, the particles of smoke and other matters are drawn from the smoke-box C and forced upon the tires and between the tires and the rails.

In employing this improved device the use of sand is obviated.

Hughes's Improved Car-gate.

DR. CHARLES H. HUGHES, of St. Louis, Mo., is the inventor of a new and improved car-gate, the object of which is to provide a simple, safe and effective gate for railway and street-cars, the platforms of railway stations, and for other similar purposes, especially for window-guards. The invention consists in a series of bars forming the gate, and, in combination therewith, of a series of tubes inserted in the car-wall and adapted to receive the bars, each bar being provided with a roller on its free end to run on the inner surface of the pipe.

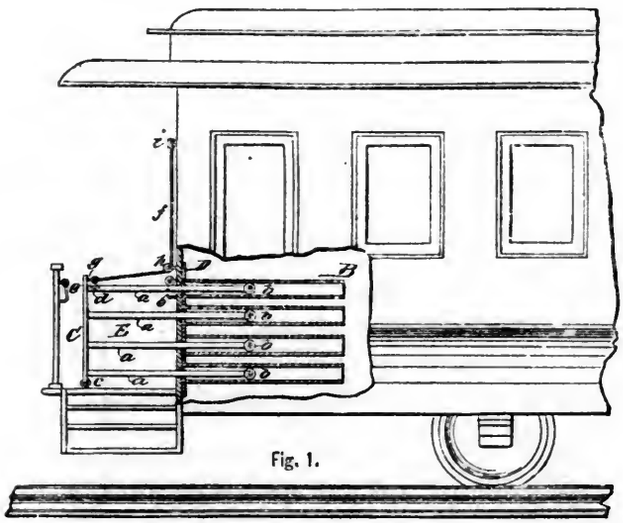


Fig. 1.

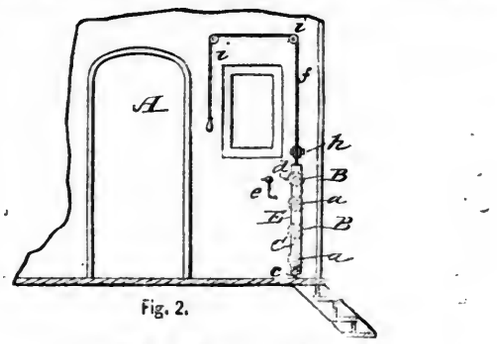


Fig. 2.

HUGHES'S IMPROVED CAR-GATE.

The accompanying cuts illustrate the device and its operation. Fig. 1 is a side elevation, partly in section, of a part of a car with the improved gate applied, and Fig. 2 an end elevation. The reference lettering is similar in the two cuts.

In the side wall of the car A is inserted a series of tubes B, which are preferably screwed into a plate D; but they may be inserted in the car-wall separately. The openings in the plate D are made smaller in diameter than the tubes B, to prevent the gate-bars from being drawn out of the tubes. A gate E, composed of the bars *a*, projecting through the end wall of the car into the tubes B, and secured at their outer ends to a vertical bar C, is capable of sliding in or out over the car-platform. The ends of the bars *a* within the tubes B are provided with rollers *b*, or with semicircular or circular heads, to steady them in the tubes, and the vertical bar C is provided at its lower end with a roller *c*, which rests upon the car-platform and supports the outer end of the gate. The openings in the plate D, through which the bars *a* slide, are made smaller in diameter than the tubes B, to prevent the rollers or knobs at the end of the gate-bars from being drawn out of the tubes. When the gate is closed, the bars *a* are partly withdrawn from the tubes B, and when it is opened the bars are pushed into the tubes. The gate is provided with an eye *d*, which is capable of being engaged by either of the hooks *e*, attached to the end of the car and to the platform-rail, to hold the gate in either an open or closed position. A cord *f*, secured to an eye *g*, in the upper end of the bar C, extends under a pulley *h*, attached to the side of the car and over pulleys *i*, which bring it within easy reach of the conductor or other person near the door of the car. By pulling this cord the gate may be opened. The gate can be set on an incline, so as to open or close automatically by gravitation.

The improved car-gate will not open by lateral pressure; consequently no accidents can happen from crowding against the gate. It is applicable to street and railway cars, and platform-exits, and entrances from and to cars, and may be applied without material change in the cars or in the building. It may also be adapted to elevator-doorways.

Gunther & Hubbard's Snow-plow.

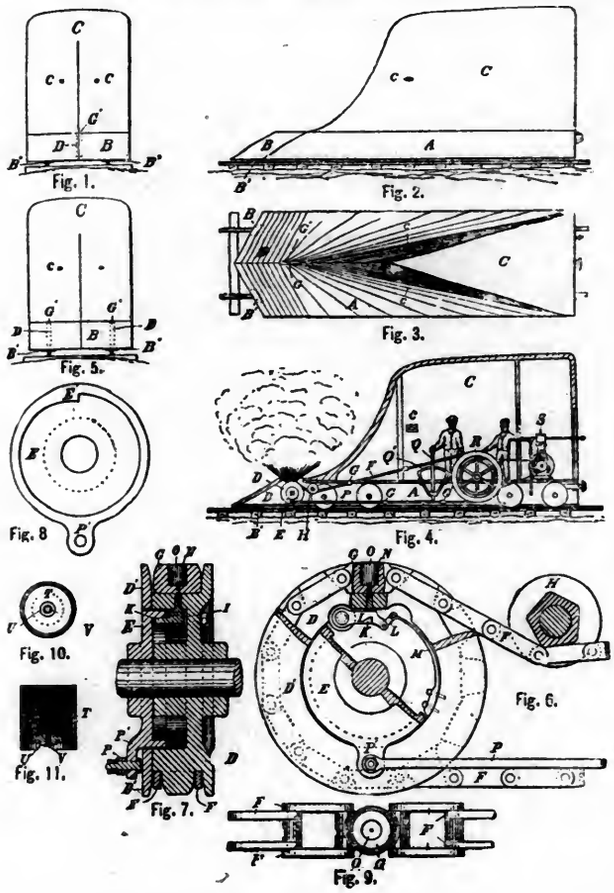
GEORGE A. GUNTHER, of New Utrecht, and H. Wilber Hubbard, of Brooklyn, N. Y., are the inventors and patentees of a new and improved railway snow-plow, which accomplishes its object by the use of explosives in front of the plow, thus loosening and scattering the snow. It consists mainly, in a snow-plow provided with a chain having receptacles for the insertion of torpedoes or cartridges, which are exploded by an automatically-operating hammer.

The accompanying drawings illustrate the device and its operations, the reference-lettering being similar throughout. Fig. 1 is a front view of the improved snow-plow; Fig. 2 is a side view of the same; Fig. 3, a plan view; Fig. 4, a longitudinal sectional view; Fig. 5, a front view of a modification; Fig. 6, an enlarged side view of the wheel over which the chain carrying the torpedoes passes, and of the chain, parts being shown in section; Fig. 7, a cross-sectional view of the pulley; Fig. 8, a side view of the eccentric or cam-disk for operating the firing mechanism; Fig. 9, a plan of the mortar and part of the torpedo-carrying chain; Fig. 10, a plan view of the cartridge, and Fig. 11, a cross-sectional view of the same.

A is a flat car, low and strongly built, and on the front end of it a pilot-plow B, is fastened, which is provided on its bottom with a chilled plate B', above each rail, so that in case the snow is packed and forces the pilot-plow downward, the chilled plates B' will be forced on the rails until the load on the pilot-plow is removed. The chilled plates slide on the track when the pilot-plow is weighted, and do not wear off as rapidly as if made of ordinary iron.

On the car A the snow-plow proper is built, very heavily and strongly, of iron plates, and is provided near its

front end with a longitudinal slot G′, below which the firing-wheel D is journaled, which firing-wheel is provided with teeth, like a cog-wheel or a sprocket-wheel, for receiving the links of the chain F, and with a single recess for receiving the mortars G, which are members of an end-



GUNTHER & HUBBARD'S SNOW-PLOW.

less link-chain F, the mortars being arranged the length of the periphery of the wheel D apart, so that for every revolution of the wheel D one mortar will enter the recess formed for receiving them in the rim of the wheel. The endless chain F also passes over a sprocket-wheel R, located further back in the plow C, and mounted on the same shaft with a pulley over which a belt passes, which also passes over a driving-pulley of a steam-engine S, in the rear part of the plow, whereby the wheels R and D can be revolved by the engine.

The mortars G are each provided with a cavity O, adapted to receive cartridges or torpedoes T, and in the bottom each mortar is provided with an aperture for receiving a firing-pin N, projecting loosely through the bottom of a recess in the wheel D, the lower end of the pin resting on a lever or hammer I, pivoted at one end to the wheel D, and having its other end coupled by a link L, with the free end of a spring M, having its opposite end also fixed to the wheel D, whereby the firing-pin N will be pressed in the direction toward the periphery of the wheel D.

The hammer I is provided with a laterally-projecting finger K, which projects under the laterally-projecting cam-rim of a cam-disk E, loosely mounted on the shaft of the wheel D, adjoining the wheel. The cam-rim or track of the disk E is provided with an eccentric inner surface having a shoulder or projection E′. Diametrically opposite the projection E′, the disk E is provided with an arm P′, which is pivoted to one end of a rod P, the opposite end of which is pivoted to a downwardly-projecting lever Q, provided with a locking-lever for locking it in the desired position on a notched quadrant Q′.

The endless chain passes under a depressing-wheel H, a short distance from the inner end of the slot G, to admit of firing at an angle to the rear. If desired, two firing-wheels D can be provided, and in that case the plow must be provided with two slots G′, as shown in Fig. 5. The snow-plow C is provided with small bull's-eye windows *c*, to admit of the operator seeing ahead.

The cartridge T is constructed with a shell of paper or metal, and provided at one end with a flanged head, on the under side of which a cast-iron plate U, is held, which is provided with a vertically-apertured boss or hub. The boss projects through a hole in the head, but is not flush with the end of the cartridge. A piece of paper, etc., is pasted on the inner surface of the plate U, to prevent the powder from passing out of the shell through the aperture in the boss. The fulminate or cap V is placed into the hole in the boss before the cartridge is inserted within the mortar. The cartridge can be capped at the time of manufacture, thus making it fixed ammunition.

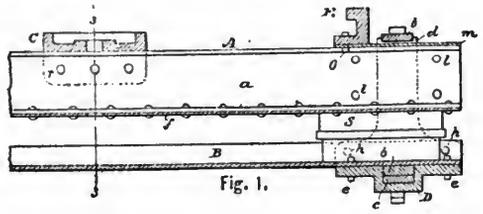
The operation of the plow is as follows: The cartridges T are placed into the mortars G, with the cap V at the bottom of the mortars, while the mortars are passing the top of the wheel R; and when the cartridges are to be fired the wheel R is revolved by the engine. The wheel D revolves, but the disk E does not, and as the finger K of the hammer I rests on the cam-track of the disk E the hammer will gradually be pressed downward—that is, toward the shaft—until its finger K arrives at the shoulder or projection E, and when the finger passes this shoulder or projection E the spring M, which has been brought in tension, suddenly snaps or forces the hammer I upward, thereby driving the firing-pin N upward and causing it to strike the cap or fulminate V, thereby igniting the explosive material in the cartridge and exploding the cartridge or torpedo. The force of the explosion exerts itself upward and through the slot G′, thereby loosening and scattering the snow in front of the plow, thus enabling the plow to be pushed forward.

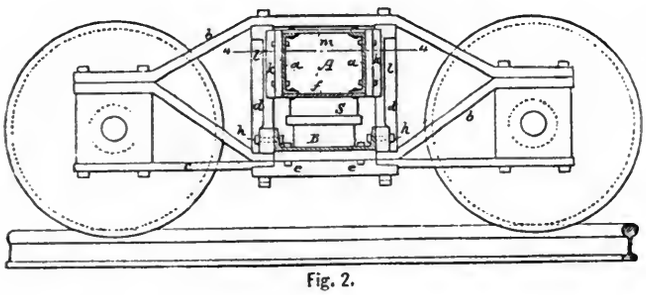
As shown in the drawings, the disk E is so adjusted that the cartridges will be exploded when directly above the shaft. By means of the rod P and the lever Q the disk E can be adjusted so that the cartridges will be exploded near one end or the other of the slot G′—that is, the transverse axis passing through the middle of the hammer—and the arm P of the disk E can be inclined more or less either toward the front or rear, and this causes the hammer to be in advance of or beyond the vertical line through the shaft, and thus the cartridge will be exploded before or after it is vertically above the shaft. The direction of the force of the explosion can thus be adjusted as may be desired.

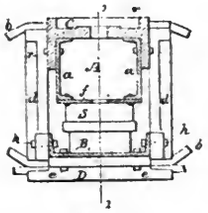
Pitkin's Car-truck.

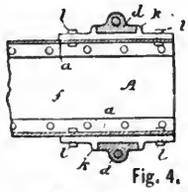
ALBERT J. PITKIN, Superintendent of the Schenectady Locomotive Works, Schenectady, N. Y., has invented an improved car-truck, the object of which is to improve the construction of the body of the truck by reducing its weight without impairing its strength; and the invention

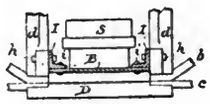
consists, primarily, in an improved organization for accomplishing this result. The improved trucks thus simplified in structure and organization contain not only less material, and are therefore much lighter than the ordinary truck, but also can be built with greater facility.

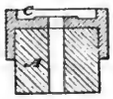

Fig. 1.


Fig. 2.


Fig. 3.


Fig. 4.


Fig. 5.


Fig. 6.

PITKIN'S CAR-TRUCK.

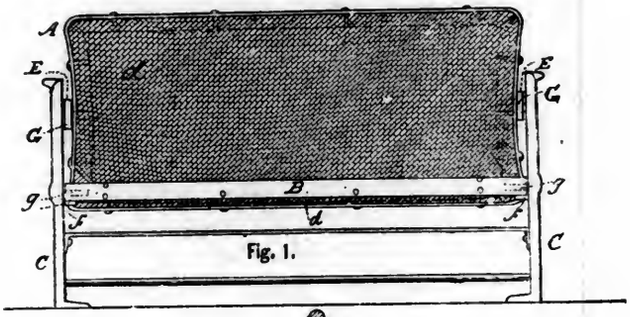
In the accompanying illustrations, Fig. 1 is a longitudinal section on the line 1 1 of Fig. 3 through one end or side of a truck-body; Fig. 2 is an end view, partly in section, showing the trusses and the carrying-wheels; Fig. 3 is a section on the line 3 3 of Fig. 1; Fig. 4 is a section on the line 4 4 of Fig. 2; Fig. 5 is a detail view showing a somewhat modified construction of the channel-plate, and Fig. 6 is a detail view showing a modified arrangement of floating bolster. The reference lettering is similar throughout the illustrations.

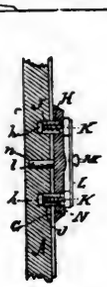
The arch-bars *b b* and the tie-bar *c*, which embrace the transom-columns *d d*, are of the usual construction. The transom-columns *d d* are, however, preferably wider than those usually employed, especially at their lower ends, where they are extended on each side, as indicated by the dotted lines in Fig. 1.

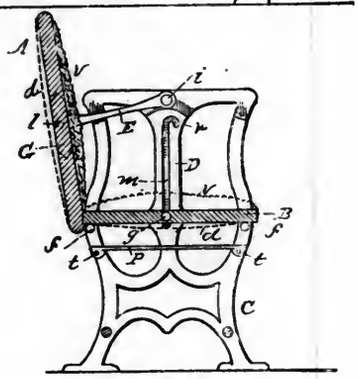
Johnson's Car-seat.

THE accompanying cuts illustrate an improvement in railway car-seats recently devised and patented by Alvin P. Johnson, of East Boston, Mass. The invention relates more especially to the upholstery of the seat and the means for changing the same. Fig. 1 is a front elevation of the seat, Fig. 2 a sectional view showing the method of securing the back, and Fig. 3 an end elevation showing the seat and back in transverse section. The same system of lettering is employed throughout.

A represents the back and B the bottom of the seat or seat proper, these parts being respectively upholstered on one side with cane or rattan *d*, and on the opposite side with plush or cloth *v*. The ends C are each provided with a vertically-arranged central standard D, having an elongated slot or groove *m*, on its inner face, these slots being turned over or curved downwardly at their upper ends to form the rests *r*, as shown in Fig. 3. The seat B is provided at either end with a horizontally-projecting stud *g*, which is adapted to enter and work in the grooves


Fig. 1.


Fig. 2.


Fig. 3.

JOHNSON'S CAR-SEAT.

m of the standards D; and projecting inwardly from each of the ends C are two studs or lugs *f*, on which the seat B rests when in position for use. The back A is provided with arms E, which are pivoted at one end to the ends C, in the usual manner, as shown at *i*. The outer ends of these arms are each provided with a T-plate G, and an inwardly-projecting stud *l*, on which the back A is journaled, these studs being fitted to work in sockets *n*. A socket H, is formed on the inner face of the plate G, near either end, corresponding sockets J, being formed in the ends of the back A. A bolt K, passes horizontally through the plate G at each of its ends, and is fitted to work in the sockets J H. These bolts are respectively provided with shoulders *h* and springs N, the springs acting expansively against the shoulders and outer ends of the sockets H, to force the bolts into the sockets J and prevent the back A from revolving on the studs or journals *l*. The outer ends of the bolts K are connected by a bar L, provided with the knob M for withdrawing both bolts simultaneously from the sockets J. A guard P, is disposed beneath the bottom B and supported on the lugs *t*. This guard consists of a wide board arranged horizontally and extending the entire length of the seat between the ends C. its object being to protect the upholstery of the bottom from being injured by the feet of the passengers in the adjoining seat at the rear.

The principal object of the invention is to enable the seat to be readily changed or converted from a Summer to a Winter seat, and *vice versa*, as occasion requires, an upholstery or covering of plush and similar warm materials not being desirable for Summer use, while, on the contrary, a covering of rattan, cane, rawhide, etc., is not desirable in Winter.

In the use of the improvement, when it is desired to turn the bottom B, it is raised until its studs or journals *g* fall into the rests *r* in the upper ends of the slots *m*, when it may be easily revolved until the plush or cane side is brought uppermost, as required, after which it is raised out of the rests and lowered upon the supporting-studs *f*. The bolts K are then withdrawn from the sockets J by means of the connecting-bar L and knob M, and the back A revolved or turned to correspond with the bottom B, or so as to bring its plush or cane-covered side to the front, as required. The slot *m* is extended slightly below the studs *f*, so that when the bottom is in position for use it will not rest on the studs *g* and thereby have a tendency to rock or vibrate.

receptacle with a rounded bottom; or the same result may be obtained by using straight sides, closing together to form a V.

Beneath the body A, and fixed to the frame-work, are slide-boards *d*, placed to form a double incline, the apex of which is at the center, where the sides *b* come together, and these inclines extend out far enough to carry the material beyond the wheels and track. For retaining the sides *b* closed they are provided with pivoted bars *e*, that engage notched pieces *f*, attached on the ends of the car. By this construction and arrangement either door or side can be opened for releasing the load, and the entire load will be discharged when the one door is opened at either side, which is often a great convenience, and if it is desired to divide the load, both sides can be released simultaneously. The shape of the body is such that the pressure on the sides will throw them open as soon as the latches are released.

The dumping-car is preferably constructed of boiler-iron, but it may be constructed of other material, and the device for fastening the hinged sides may also be modified. The invention is applicable to any dumping-vehicle as well as to railway cars.

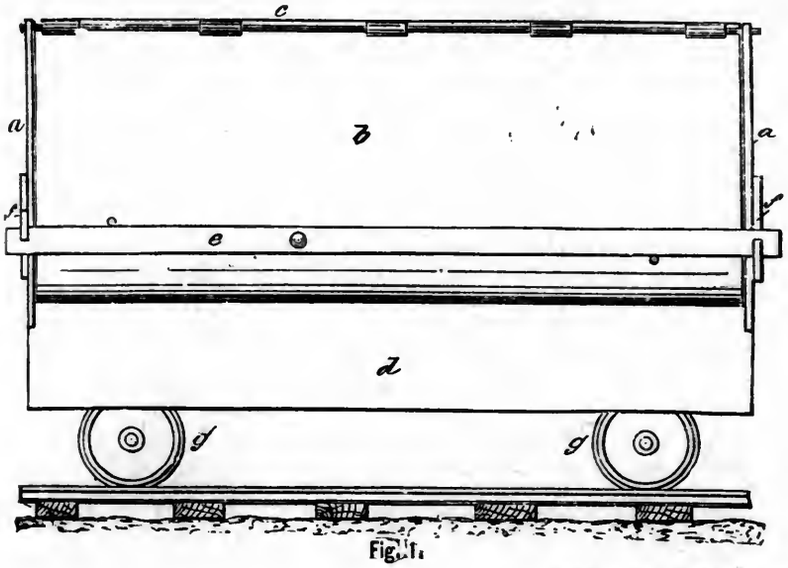


Fig. 1.

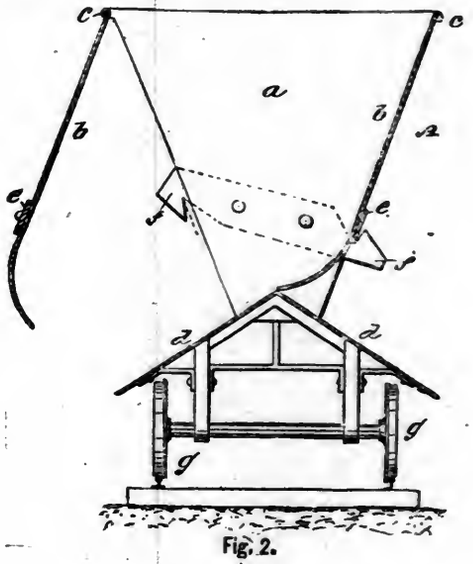


Fig. 2.

SHERROD'S DUMPING-CAR.

Sherrod's Dumping-car.

BENJAMIN W. SHERROD, of Birmingham, Ala., has invented a new and improved dumping-car which is herewith illustrated and described. The object of the invention is to furnish a car for carrying coal, coke, gravel, and other material, so constructed as to permit the dumping of the entire load at either side; and it consists in a car made with a body in V form, the inclined sides being hinged at the top and meeting at the bottom above double-inclined slide-boards.

In the accompanying illustrations, Fig. 1 is a side elevation of the dumping-car, and Fig. 2 a transverse sectional view of the same. The reference-lettering is similar in the two figures.

The car is mounted on wheels *g*, which support the body by suitable frame-work. The body A is composed of ends *a a* and sides *b b*, which are hinged at their upper edges to side-rods *c*, that connect the ends *a*. The lower edges of the sides or doors *b* are curved inward, so that they unite when both are closed, thereby forming a tight

---

MESSRS. BRADLEE & CO., chain-makers of Philadelphia, have recently had the Chain Testing Machine tested and approved by the British Lloyds. This machine was built several years ago at the Philadelphia Scale and Testing Machine Works, Riehlé Bros., proprietors. The Messrs. Riehlé have recently furnished another large chain works with one of their improved chain testers of 100 tons capacity, and have also constructed a cement tester for the United States government at Washington, this make of machine being preferred to all others that were offered. The Board of Public Works of New York City, have adopted the Riehlé Cement Tester as the standard.

THE Norwegians have gained credit for setting to Europe the example of having ice-water in the compartments of their railway-cars. In England that extraordinary luxury can still be only obtained at certain stations along the line at a penny a glass.

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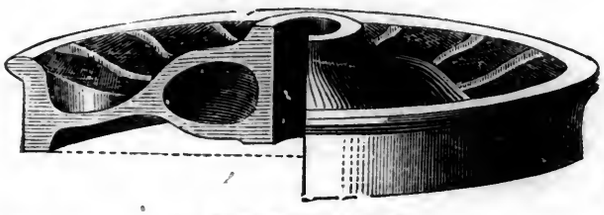
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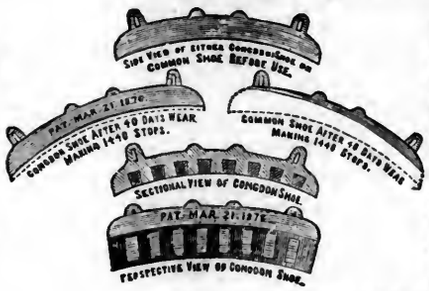
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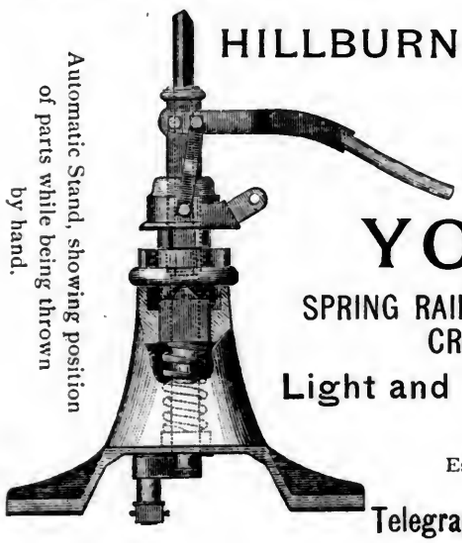
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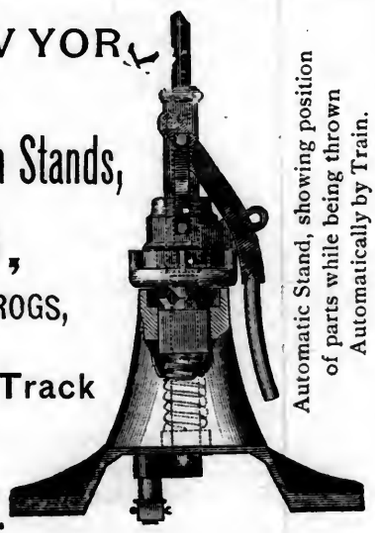
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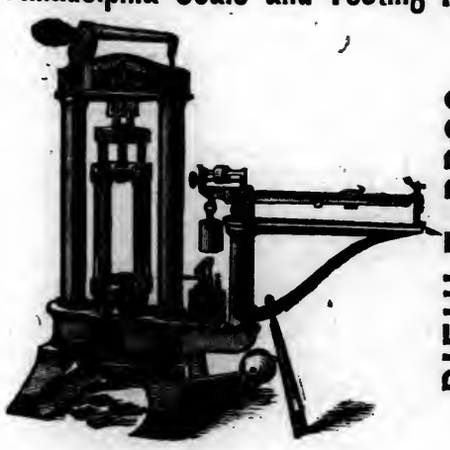
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American Railroad Journal.

WHOLE NO. 2,559.] NEW YORK, DECEMBER, 1884. [VOLUME LVIII.—No. 9.

THE COAL INDUSTRY OF THE WORLD.

BY S. H. FINCH.

[Written for the AMERICAN RAILROAD JOURNAL.]

WHILE it is believed that the construction and maintenance of the plant of railway and kindred enterprises requires all the skill in design and selection of proper materials entering into each member of so varied structures as are connected therewith, and much more than is usually allotted, and that it is desirable in the highest degree that special care be taken in the training and educating of competent constructors in order to meet upon equal terms, present or future competitors; it is also considered within the limits of the economic section of engineering to discuss the commercial features of such enterprises. In accordance with this belief the following glimpse of the coal production of the world, together with mention of new uses and extended territory for coal trade is submitted for the consideration of readers of the AMERICAN RAILROAD JOURNAL.

The great coal-beds of this country lie in six detached areas, and are styled respectively, the Rhode Island, Appalachian, Michigan, Illinois, Missouri, and Texas coal-fields. The Rhode Island is the smallest, and comprises an area of only one thousand square miles. The Missouri is the largest, and covers about one hundred thousand square miles.

The era or period of carbon deposits was initiated by the formation of the conglomerated sandstone known as the millstone grit, and which contains thin seams of coal, but is often called the false coal measures. During this period, the fishes and ferns of the Devonian age were buried beneath vast accumulations of sand and gravel, and only occasional seasons of quiet occurred, when vegetation would make some progress.

The coal measures proper, present rocks of every kind, sandstone, shales, limestone, etc. They can be distinguished from the other strata only by their fossils. The thickness of the coal-bed is at places not more than that of a sheet of paper; at others it is from thirty to forty feet. The "mammoth vein," exposed to view at Wilkesbarre, Pa., and worked at Mauch Chunk, Shamokin and other places, is twenty-nine and a half feet thick. The Pittsburg seam is eight feet thick and may be traced for a long distance as a conspicuous black band along the high banks of the Monongahela, and it is estimated that for every foot in thickness, a coal-bed produces one million tons per square mile. Iron ore is also abundant in the coal regions, and is distributed in nodules, often of great weight, or in thin seams so as to injure the coal-getting to a considerable extent.

Baussingault calculates "that luxuriant vegetation of the present day takes about half a ton of carbon from the atmosphere annually," or 50 tons per acre in a century. Fifty tons of coal spread over an acre would make a layer of less than one-third of an inch in thickness; but assume that it is half an inch, then the time required for an accumulation of a seam of coal three feet thick—about as thin as can be worked advantageously—would be 7,200 years. In the coal measures of Nova Scotia there are seventy-six seams of coal, one of which is thirty-seven feet thick, another twenty-two.

Plants are the characteristic fossils of this period. Everywhere the shales bear impressions of the delicate tracery of ferns, leaves and stems depicted with the sharpest outlines. Trunks of trees, erect or prostrate, appear with their roots yet embedded in the layer of clay, the soil in which they grew underneath the coal, and reveal perfectly the vegetation of the period. The leading forms are tree-ferns, rushes and club-masses, which grew to a size unknown in our climate, and the ferns which to-day creep at our feet, then towered into stately trees with trunks a foot and a half in diameter. They are abundant as fossils and doubtless contributed largely to the formation of coal. Dr Buckland says: "The most elaborate imitations of living foliage upon the painted ceilings of Italian palaces, bear no comparison with the beauteous profusion with which the galleries of these instructive coal mines are overhung; the roof is covered as with a canopy of gorgeous tapestry, enriched with festoons of most graceful foliage, flung in wild, irregular profusion over every portion of its surface."

The surprising increase in coal production during the last thirty-five years is of such magnitude as to claim some notice, being about as follows:

Great Britain extracted in	1845	31,500,000	tons.
	1874	125,043,000	"
	1884	143,500,000	"
Belgium extracted in	1845	4,960,000	"
	1874	14,669,000	"
	1884	16,250,000	"
France extracted in	1845	4,142,000	"
	1874	16,949,000	"
	1884	20,000,000	"
Prussia extracted in	1845	3,500,000	"
	1874	41,754,600	"
	1884	45,500,000	"
Austria & Hungary ext'd in	1845	709,706	"
	1874	12,810,900	"
	1884	13,900,000	"

From these five countries the combined production will be seen to have risen from 44,811,700 tons in 1845, to 211,200,000 tons in 1874, and to 339,150,000 tons in 1884. While the production in the United States was, in the year 1845, only 4,400,000 tons, in 1874 it had reached 42,423,900 tons, so that the total increase in the output of coal for the world was nearly 205,000,000 tons from 1874 as compared with the year 1845.

Statistics are not available for determining the increased uses or demands for coal which, however, may or may not be in the gross proportionate for so extended a period, and a consideration of existing circumstances affecting the present outlook for the anthracite coal trade will be

of much more interest than opinions or comparisons of comparatively remote periods.

The total production of anthracite for	1873 was	21,263,220	tons.
" "	1874	20,178,613	"
" "	1875	19,725,471	"
" "	1876	18,535,557	"
" "	1877	20,847,681	"
" "	1878	17,605,262	"
" "	1879	26,142,689	"
" "	1880	23,437,242	"
" "	1881	28,500,016	"
" "	1882	29,120,096	"
" "	1883	31,790,000	"
and it will be say for 1884		32,500,000	"

The high calorific power of anthracite, and the low percentage of sulphur and ash contained in most varieties, naturally render it of great value as a fuel in the cupola and the blast-furnace, while from its abundance and the small cost with which it may be generally worked, it should be at once the cheapest and best fuel that could be used.

This is doubtless generally recognized, and the accompanying table showing the total pig-iron production of the world is believed to warrant this belief, as the growth and development of pig-iron production is the result of coal mining:

	1850.	1860.	1870.	1875.	1883.
Great Britain	2,249,998	3,700,000	5,963,515	6,365,462	8,490,224
United States	564,755	815,595	1,659,850	2,017,257	4,595,510
Germany	400,000	600,000	1,236,449	1,743,801	3,380,788
France	141,563	313,544	553,929	529,663	770,669
Austria and Hungary	235,000	325,000	394,899	446,122	420,300
Russia	222,998	291,000	352,517	420,484	*462,027
Sweden	139,389	181,434	294,460	343,680	391,000
Spain	50,000	50,000	50,000	75,000	85,000
Italy	25,000	25,000	25,000	25,000	25,000
Norway	9,800	7,500	3,890	3,800	5,600
Others estimated	50,000	50,000	50,000	50,000	50,000

——*Russia 1880, 1883 not known.

It goes without saying that there is a very extended stagnation in all trades, but the belief is almost universal that the general business of the country will soon show signs of improvement, and the coal trade must receive some share of it. If the carrying companies should—as it is reported they have agreed to do—restrict shipments in order to advance prices by the aid of combination, it must result in a sacrifice of the near future for expected present benefits which will be comparatively small, although some kind of combination may be and doubtless is necessary to protect the immense sums involved in coal producing and transportation.

The cost of mining and hauling to the seaboard or consuming districts is now probably as low as rigid economical supervision can make it, and the further reduction of this expense may only be expected by the further introduction of labor-saving machinery in cutting and making ready for market, by the improvement of vehicles used in transport, by the erection of apparatus at tide-water for trans-shipments with a minimum of manual labor, and by a continually increased adaptation of means for producing given results, and, to secure which, the employment of higher-class skill in superintendence as exemplified in technical education, directed to the management and development of this specialty as well as the gain sure to follow the improved condition of the men engaged in coal-getting.

It is often stated with respect to the unproductive employment of labor as a common proposition, that while there is but little to do and thousands are out of employment, any change which reduces the number of unskilled workmen is not desirable. Yet there can be no doubt of the fallacy of such argument. To increase consumption and consequently production, the value of commodities must be reduced by economic methods, and the very reasons which are often urged as causing trade depression are the means to employ for its increase.

This country is not without evil prophets, and the present state particularly of the coal and iron trade seems to give some weight to their forebodings that trade will never rise again to what it has been. Because coal is a drug in the market, and the manufacture of iron no longer profitable, no one need conclude that the consumption is falling off. The reason coal is so unremunerative to the producer is not altogether on account of the consumption, but that too much coal has and is still being mined. But as coal is so large a factor in the cost of iron-making, it is fortunate that to the low price of iron we have not to add a scarcity of fuel.

Coal and iron are continually increasing in quantities consumed; more trade will be done but at no profit, and the cause of the low prices can only be found in the power of production having been too much increased in consequence of so much capital having been tempted into the trade by the high prices.

The present suffering is then the result of natural consequences and reaction, and there can be no reason for charging it entirely to non-consumption.

POPULAR RAILWAY EXCURSIONS.

BY HARRIS T. GURNEY.

[Written for the AMERICAN RAILROAD JOURNAL.]

AMERICANS are essentially sight-seers, and it is only necessary for a "celebration" to be announced as occurring in any locality, when the various railways are ready with popular excursions at reduced rates to the point of interest. The numerous centennial celebrations which have been inflicted upon the country during the past eight or nine years have, in great measure, stimulated a desire on the part of its inhabitants for brief excursions in which they can indulge at a comparatively small cost; and it is rare that a year passes without celebrations of some sort being provided that will gratify this desire. The winter carnival at Montreal with its ice-palace and other varied attractions has come to be regarded as a fixture, and excursion tickets are sold to the Canadian metropolis at very much reduced rates. As a result there is a great influx of people from the States, and the carnival is yearly becoming more elaborate. This winter the exposition at New Orleans will be a favorite tour for our roving population, while the inauguration of President-elect Cleveland affords a fine opportunity for the announcement of railway excursions, since Washington will then be regarded as the Mecca of the Democracy.

We are a hard-working people, and these occasional trips are not to be grudged us. The expense attending them is generally slight, and if they serve no other purpose they will at least remove the cobwebs from tired heads that have been bending over law-books and ledgers for many weary months. Rather should the railway excursion be encouraged as an institution that affords us more solid pleasure in direct ratio to the expense incurred than any other diversion. There is, however, at present a lack of system in these excursions for which the railways are not entirely responsible. The marked events serving

as pretexts for the excursions occur at irregular intervals, and frequently two take place at the same time, which "simultaneousness" robs each of a full degree of success.

I am not sufficiently versed in the accounts of the various railways to form an estimate as to the profits resulting from these popular excursions, but since the railways are always ready to announce them at reduced rates, it is fair to presume that they are profitable, for I am not quite ready to believe that railways cut their rates through philanthropy alone; and if they are profitable it would be well for the railways to assist in furnishing the celebrations. They are not difficult to arrange, and as a rule not over-expensive. Certainly the receipts from the spectators more than cover expenses, and as everybody is contented it is fair to assume that were these celebrations increased in number, the profits to the railways would be still greater.

As it now stands, the chief attractions to the spasmodic traveler—an individual who is tempted through low rates and an economy of time to make a hurried pleasure-trip—occur in winter. In the summer months when trade is at its dullest there are few events occurring of more than passing interest, and consequently but few railway excursions. The fourth of July is generally a day when the traveler can find a ticket to certain points at reduced rates but there is little occurring to prompt him to the journey. The national conventions of our two great political parties are but quadrennial occurrences and are not over-attractive even at these rare intervals to the peaceable American. Undoubtedly there are a number of wonderful spots where natural scenery abounds in great profusion and beauty, but they are there for all time, and one is not prompted to embrace the opportunity of visiting them by that great American force of reasoning: "You will never have another chance of seeing them." The centennial exposition in Philadelphia, in 1876, was the only favorite and popular excursion that has been offered us in the months when we are most likely to have the time at our disposal to embrace the opportunity of patronizing it.

In what direction, then, must we look for fields in which to extend the railway excursion to the proportions of a national institution? We have had our fill of expositions and with the close of the New Orleans exposition, our taste for that form of sight-seeing will have been subjected to a cloying process that will rob it of its zest for some years to come. We cannot have a Brooklyn Bridge opened every year, neither will the genius of history come to our aid with centennial occurrences of national interest. Mere sporting events do not awaken the interest on this side of the Atlantic that they do in England and the continent, and we have no "Derby day" to herald with grand and popular excursions. It is evident that the *raison d'etre*, so to speak, of popular excursions must be manufactured, and to this end the energies of railway managers, as the class most interested from a financial point of view, should be directed. As in the theatrical business, the public taste should be sounded and gratified. To speak metaphorically, if the public want spectacle give it to them; if they want tragedy, give it to them—though in this connection I do not wish to be understood as commending the enterprise of certain railways in the South which make a specialty of running excursion trains to witness executions—and if they prefer a mixture of drama and farce, why provide it with a lavish hand.

The points to be chiefly considered are three. In the first place the excursion should be inexpensive and within the reach of the many. For this reason the "attraction" should be something that does not depend upon sectional peculiarities to an extent that will confine it to a particular and remote section of the country. Second in importance comes the question of time. The popular excursion should occur at those periods when it can be patronized without detriment to business, and most fortunately this period is the identical period when the system most craves diversion—the summer months. Thirdly, the duration of the excursion should be brief. I do not mean that the "attraction," for I know of no other word to express my meaning, should be exhibited for a short time only, but that it may be possible for the visitor to indulge himself with the loss of but a few days from his regular employment. Let these conditions be fulfilled, and I am convinced that the patronage of the popular railway excursion would increase yearly until it became an established institution.

In advocating the increase of popular excursions under circumstances and with surroundings that would assure them great patronage, it is perhaps only fair to instance a possible "attraction" for a grand popular excursion that would appeal to everybody. Possibly the ungrateful railway officials may not thank me for mentioning it, but I will at any rate give them the benefit of the suggestion without hope of reward. Let all the trunk lines having termini in New York City contribute the trifling sum necessary to complete the Bartholdi statue pedestal and then arrange for an excursion at the erection of the statue that will distance in grandeur anything hitherto attempted. The very heavens should be painted red for the occasion, and the waters of the harbor dyed a rich vermilion to be in harmony with its surroundings. Seriously it would seem feasible to seize upon the erection of the statue—if the event is to occur during the existence of the present generation—as an occasion for a series of popular excursions, and it may occur to the railways that they have a possible interest in the completion of the pedestal.

One suggestion of this kind is enough and I dare not risk another; but it is evident that the American people are quick to avail themselves of the opportunity of travel if they can do so cheaply, at a period when they are least engaged with their several occupations and with the expenditure of but a few days' time. Above all are they prone to patronize such trips when they are offered something novel at the points of destination, and the ingenuity of the railways could be taxed with profit to provide this something, instead of waiting for history or Nature to furnish it, which they do at but rare intervals and with little regards to the convenience and inclination of poor mortals. That the ingenuity of railway managers would be taxed in vain to furnish the necessary objective attraction does not seem likely. As for that it would be a simple thing to offer a prize for the best suggestion relative to the attraction for a popular railway excursion, and I believe that very few days would elapse before a multitude of answers would be received. If necessary, "Indian cemeteries" and "relics of the Norsmen" can be built to order, and they would answer the purpose just as well as the genuine articles. Americans are only particular as to what the thing seems to be; they care not for the *is*; and under these circumstances it is an easy matter to cater to their tastes.

LUBRICATING AND LUBRICANTS.

BY E. F. DIETERICHS.

[Written for the AMERICAN RAILROAD JOURNAL.]

VIII.

CONCLUDING REMARKS.

ALL that has been said hitherto about lubricating machinery is likewise applicable to the lubricating of vehicles of all kinds and constructions, when also the best quality of lubricant is the cheapest and most efficient. Lubricants of gummy nature, and such as change their consistency under the influence of hot or cold weather, are unfit for use and injurious to the axles; and increasing the drag, needlessly exhaust the motive power employed. Unfortunately, here also false economy calls for cheap oils or grease, hence the endless number of inefficient and vilely adulterated oils and so-called axle-greases, redundant with rosin and all kinds of inert substances. For heavy vehicles, grease of good quality, and for light conveyances, oils free from tendency to gum or congeal or liquefy, should alone be used.

Before applying the lubricant, the axle, box and hub should be carefully cleansed from dirt and sand and the combined accumulations of dust and gummy deposits, and the lubricant should be applied as sparingly as possible, but as often as necessary to replace that which has been consumed before the axle becomes dry. Of oil very little is required, as the metallic surfaces of the box and axle alone require lubricating, and all reckless and needless pouring on of oil, thereby saturating the wood of the hub, is a useless expense, and gives rise to such silly complaints as "Injury to the wood from the use of mineral oils," when cheap and poor and unseasoned wood had been used by the manufacturer.

Lubricating is not solely limited to machinery and vehicles, but it constitutes also an important factor in the use of leather. Hide when deprived of its natural lubricating moisture becomes dry and the fibers when in motion against each other become brittle and are destroyed by the frictional heat. When converted into leather this also would soon become useless for wear, were it not for the interposition of fatty lubricants known as "stuffings of leather," which relieve the frictional action of fiber against fiber. Just as we have recourse to processes by which we harden and strengthen metals to make them more durable, so we try to protect leather and make it more durable by the different processes to which it is subjected; but unless the frictional action of fiber against fiber is relieved by lubrication, the frictional heat evolved must destroy the fiber, and here, also, as in lubricating machinery or vehicles, the lubricant has to be renewed from time to time as it has fulfilled its function, and the more volatile the fatty substances employed, the oftener they require renewal. Leather is much more susceptible to ravages by acids or alkalies than metal of which machinery is constructed, and the use of lubricants containing either should be most carefully avoided; equally so should inert matter be omitted in the composition of good leather oils and dubbings, since when the fatty parts of the lubricant, in filling its vocation, leaves this inert matter behind, it aids the abrasion of fiber against fiber when in motion. The application of blackings, dressings or varnishes to leather is intended to give it proper appearance on the surface, but unless the fibers are kept protected from time to time by good lubricating, these dressings, by the very nature of their compositions and their requirements, would seriously interfere with the life of the leather; but they can fulfill their purpose harmlessly if applied on the surface of leather well protected by a good lubricant. Such lubricant protects the leather also against the influence of the atmosphere, snow and rain, against ammonia emanating from perspiration of the feet in case of boots and shoes, or from the body of animals in the case of harness and, in case of belting, the alternate influence of dryness and moisture in workshops.

No drying oils should ever be used for lubricating, nor lubricants containing inert matter except for temporary relief. All mineral oils containing grit, or not entirely free from dangerous volatile constituents should be carefully discarded, and the selection of lubricants for purchase and use be guided solely by their purity and quality of material used in their manufacture, and not alone by their price. The best are the cheapest. Good lubricants can only be made or selected by those who intelligently understand the theory of lubricating and the characteristics of fatty matter.

That lubricating is of more importance than generally looked upon, is easily shown by the fact that not a wheel could be turned, not a sewing-machine used, no steamboats, locomotives and cars, or any kind of machinery moved, without the use of some lubricant.

THE INTERIOR DECORATION OF PASSENGER-CARS.

BY A. A. KELLY.

[A Paper read before the Master Car Painters' Convention, Boston, Mass.]

ABOUT a dozen years ago, and just prior to the business panic of 1873, the most lavish expenditure for ornamenting and upholstering of passenger-coaches was indulged in, and was carried to such excess that a reaction was finally the result, this being in accordance with the pretty thoroughly grounded rule that one extreme is sure to be followed by another of an opposite character. The rarest and richest woods were employed in fine cabinet work, trimmings and in other ornamental work, and the American passenger-coach was made only less regal and luxurious than the veritable palace. The years of business depression which followed the panic of the afore-mentioned year was not without its effect upon the railway companies, and by the instituting of the most stringent business and financial policy upon their part, many retrenchments were made, and in no direction more closely than in the car constructing and painting departments. Veneering, in its day deservedly popular and a vast improvement upon painted work, had been abandoned for the solid finishes. Now it was again adopted, and old coaches were brought out and their old veneerings scraped and revarnished, and made to look tolerably respectable. Others were painted or handsomely grained: and though these refurnished cars had the appearance of being second-hand at best, yet the plan pursued was not only in perfect ac-

cord with the general feeling of the times, but denoted a sound and commendable policy on the part of the companies.

Five years or so of this enforced policy of economy was at last succeeded by the revival which followed the great iron boom of 1878–79, which set in motion all the collateral industries again, and gave to business an impulse which soon had its effect upon the railway service, in the demand for finer coaches. By the operation of the same healthful force the companies were abundantly able to comply with the popular desire in this respect, and by the aid of inventive genius and liberal expenditure of money were enabled to surpass all former efforts.

Veneering was again discarded and relegated to the past, never more, I venture to predict, to come into general use, as a means of decorating coach interiors. Not that I believe with some that it is a despicable sham or a cheap device, or other species of deception, for I believe it to possess many merits entitling it to a respectful consideration. But it has lived its day; and solid woods are to be preferred instead.

Once in a while you will still see old cars with a veneer finish, and what an antiquated look they have! And now and then one meets with the old-fashioned black walnut finish, with gilt or cream-colored moldings, and similar relics of the former age of car decoration. But mahogany has superseded the black walnut finish, and when put in plain and solid, as it usually is, and made to resemble a mirror in point of luster, the effect is strikingly rich and elegant. The native hardwoods also come in for a share of popular admiration, the beauty of ash being particularly noticeable. In the coaches of the Pennsylvania Railroad, ash is used exclusively for interior construction, and the employment of this wood gives great satisfaction to the traveling public, by reason of the cheerful appearance it imparts to the interior. It also possesses a neat and cleanly appearance, not characteristic of dark woods or painted work.

Accompanying this style of finish should be the unique Eastlake ornamentations in designs and carvings, which are based on the principle that ornaments should not be constructed, but constructions ornamented.

As to the comparative merits of the various materials advocated by some decorators for use in interior finishing, other than natural woods, and some of which have been tried, I would advance as my opinion that nothing will more fully meet with what is required of it, as an article of utility and ornamentation in the finishing of passenger-cars, than these simple natural woods. I am aware that it has been urged against their use that they will darken with age, often assume a dingy, clouded appearance, and generate an impression that the car is soiled and dirty even when perfectly clean. Though admitting that this objection is not without foundation in fact, yet it must be remembered that this fault only exists where the finish has not been properly executed by the painter. For certain it is that the wood will retain its natural beauty of color almost an indefinite period, if skillfully treated. I do not believe that the wood should be surcharged with linseed oil, preparatory to applying the fillers, for the effect is to cloud and blur the original purity of the surface. And the evil deepens as the oil dries, by reason of the chemical changes which it undergoes in the process. Corn-starch fillers, though finding many advocates of their use among the members of this association, are open to the same objection as oil, in that they change and darken, imparting a prematurely old appearance. Now it appears reasonable from the very nature of the case, and the idea is abundantly supported by the weight of experimental research, that a filler having as its base of composition, silica, which is colorless and not subject to atmospherical changes or other influences which operate injuriously upon most other preparations, must be the best adapted to the purpose of closing the pores of the wood, and thereby fitting its surface to receive the coats of varnish, which are to more clearly bring out the delicate lights and shades and veins, and also to protect the wood. When such a filler is employed and the work skillfully and honestly executed, and the best grade of varnish or oil finish, so called, is applied, we may confidently expect a job that will give satisfaction, and be truly a thing of beauty, if not exactly a "joy forever."

By the aid of ingeniously devised machines, these natural woods are beautifully carved and artistically ornamented in the modern styles at a nominal cost, and we are given all the advantages of decorative effect which would follow the use of hand-worked ornamentation. As the builder puts in all this work, the painter's duty consists simply in properly finishing it, and I have already intimated how this should be done.

As to the matter of head-linings, the subject has received some attention at your hands in former conventions, and I should only be traveling over old ground in rehearsing what you have said regarding it. But I may be permitted to recapitulate some of the points which have been drawn out in those discussions, believing that they will prove of interest. At your last annual convention you discussed the comparative merits of muslin and wood for car head-linings. Some favored wood, as it cleaned up better. Some thought it had all the advantages of cloth, while others predicted that paper would become the future head-lining. This latter material was being used with the greatest success, so it was stated. It appeared that the paper linings were grained in imitation of wood and then decorated. It was also said that an elevated road in New York thought of taking out wood linings, as they were not doing well, owing to dampness, which caused the veneers to peel, and also that the expense of the wood was as three to one against cloth or paper.

It is scarcely worth while to debate the question to-day as to the merits of the different materials suggested, as they are all to be superseded, I believe, by another substance (of which I shall make mention further on), which possesses all the merits of the above articles, with an additional feature which must commend its use to every car-shop in the country.

But I wish to say that, in my judgment, no poorer material for a head-lining could probably be found than paper, durability and appropriateness being considered. Besides, such a substance would tend materially to add to the already too combustible nature of passenger-car interiors, which of itself should constitute a cogent reason for its non-adoption for the purpose designated. Nor is muslin or cloth much, if indeed any better, than paper, while veneering should be left severely alone. As for the graining on the paper, it is a species of cheap work that will find no favor among those who despise that form of vulgarity in decorative art, and who look for the true and

beautiful in all things. Last fall, a writer in the *National Car-Builder* suggested that papers, plain and in relief, and in imitations of leather or in the Japanese styles, might "be used in car work in a most striking and beautiful manner." But the idea of decorating a car as one might decorate an apartment in a house, strikes one as being rather an ignoring of the law of place and utility, which should govern in all such cases. We would not like to associate the idea of a decorated room with a coach, as it flies and rattles over the rails, as the impression gained would be a feeling of insecurity and a sense of the violation of the principle of utility in the construction of the vehicle.

It is a pleasure to note that a very important step in the improvement of passenger-cars has just been taken, in the proposition of Mr. George Mann, of Buffalo, N. Y., to make the inside incombustible by using asbestos as an upholstering for seats, materials for curtains, and lining for the entire interior of the car; this to be covered, when used for upholstering or ceilings, with a fine wire cloth on which ornamental designs may be wrought. The adoption of this method will revolutionize the entire system of decoration as now pursued, and render any attempt on our part to outline rules for interior decoration futile. The safety of the passenger being a matter of importance paramount to all others in the construction of the car, it will readily be perceived that the general adoption of Mr. Mann's plan must be simply a question of time, and that passenger-coaches will continue to be models of luxurious ease and artistic elegance no one can doubt, for the public having become so accustomed to their use, they are now regarded as much of a necessity as first-class hotels. Besides, the rivalry existing between the different roads will cause them to furnish the handsomest and most convenient cars for the use of patrons, and will insure a very high standard of service in every other respect.

Undoubtedly the best essay that can be obtained on the subject before us is the personal inspection of the handsome coaches now being put out by the various car-shops of the country, notably by the Pullman Company and the Mann Boudoir Company. The latter company is proving a dangerous rival to the Pullman. It has some cars on the Boston and Albany road that for sumptuousness and general excellence of finish and attention to comfort are not surpassed, if indeed equaled, by those of any other company.

These cars are divided into apartments resembling state-rooms, arranged with high-backed sofas by day, and comfortable sleeping-berths by night. On entering the car at either end, having passed through the vestibule where the porters' and toilet-rooms and buffet are located, a corridor about three feet wide is reached running the entire length of the car on one side. Eight rooms are off from this corridor; five have two, and three four berths each, which extend across the car, the occupant lying with his head toward the corridor. There is ample room for dressing, convenient racks for clothing and baggage, and an electric bell connecting with the porters' room. The ventilation is excellent. A scoop on the top of the car near the front gathers the air, which is forced to pass through a tank capable of holding 600 pounds of ice. Beneath is a pile of excelsior kept wet by the drippings of the melted ice above. The air pouring through the moist excelsior is carried through a flue, extending the entire corridor length of the car, and into the bedrooms by ventilators, and the ventilation is rendered perfect by a ventilator being placed at the top of each boudoir, thus affording an outlet for the air. The walls and floor of the car are packed with granulated cork, shutting off heat and sound. Refreshments may be obtained at the buffet at either end of the car. The cars are 64 feet long and 10 feet wide. Such is the description given by some writer of a magnificent triumph of modern car-building.

The July number of the *Painters' Magazine* gave a description of a parlor-car built by the Pennsylvania Railroad Company at their Altoona shops, and which is only one of a series of similar coaches to be constructed by this company. Its capacity is slightly less than that of a Mann boudoir-car, being 62 feet in length by 9 feet 10 inches wide. The seats are of three kinds, fixed and movable chairs and sofas, 37 seats in all—six in a compartment, similar to the old-time church pews, only they can be divided off by curtains. The smoking-room is large and has 10 seats. The ladies' toilet room is also large, elegantly appointed, and the gentlemen's wash-room is conveniently adapted. A striking feature—and a very original one, by the way—of this car, are the five bay-windows on either side, each 7 feet 4 inches by 2 feet 2 inches wide, with a central window 3 feet wide. Unlike the bay-windows of a house, these windows diverge from a straight line inward, not outward. The car is substantially built, and the general aspect of the interior finish and ornamentation is in marked contrast with old standards. The woodwork is oak, the lower portion—the dado of the car—has a series of very small panels. The ceiling is of one color—a deep Pompeian red—and the whole interior, of lamps, of *repoussé* brass-work, paneling, carving, molding, etc., is skillful and artistic.

In conclusion, I would suggest that the principles which govern decoration as applied to the interiors of our homes may be safely followed in the adornment of railway passenger-coaches. The scheme of decoration should always be in accord with its surroundings and the purposes for which the vehicle is designed. Extravagances of high art should not be indulged in, though the colors and style of ornamentation may be both light and cheerful. Nothing should be attempted that may conflict with good taste. Traveling by rail is not the pleasantest experience in life, and when one is forced to undertake it the trip should be made as endurable as possible, and to this end all our inventive talent in railway industries seems to be directed. Passenger-cars are public educators in decorative art, and we should be careful that the lessons given are not untrue ones.

INVESTIGATION OF ACCIDENTS.

IT is a matter for surprise to an observing person, that there are so many railroad accidents of which the causes are shrouded in mystery, and yet that a careful examination into all the circumstances of one by a Railroad Commission, Board of Trade, or other independent and disinterested body, almost always arrives at a definite conclusion fully explaining why the accident occurred. Perhaps the investigations which oftenest fail to account in a reasonable manner for the occurrences which are the subject of inquiry are those conducted by coroners with the aid of a jury, and those undertaken by the officers of the rail-

road companies. In the case of the coroners the examination is usually under the skillful guidance of an attorney, who has a theory to be established, and who often arranges the facts in accordance with it instead of requiring his theory to conform to the facts. It is within the memory of living men how, in the case of a great washout, the attorneys were so anxious to prove the culvert to have been big enough that they established, in the face of the officers of the road and of a jury which had passed the culvert every day for years, that its opening was 7 ft. in diameter, when in fact it was only 4 ft.

But the reasons why railroad official investigations fail so often are almost as mysterious as the causes of the accidents, for surely the superior authorities should be anxious to learn all the facts concerning them, so as to derive as much benefit in the way of instruction as they may, in compensation for the damage which the disasters have occasioned. We think that the principal reasons are: First, that the higher officials are generally remote from the scene of the accident, and do not often see the results for themselves, only hearing of such details as may be set down for them in a partial report; or, if they do visit the scene of a notable disaster, it is for a few moments only, after things may have been somewhat put in order; and, compelled by more important duties to hurry away, they lose sight of the small particulars which might have proved full of instruction; and, second, that in almost all such events, there are persons concerned who do not wish the exact facts or the true causes to be known, and who are more active to conceal than the investigators are to find out the truth. If there exists upon a railroad any *esprit de corps*, it is shown in the reluctance with which every employé, below the grade of division superintendent, will reveal any circumstance which shows another employé to have been at fault. Of course, when the fault is plain, so that it cannot be concealed, there will be many to prove their zeal by an open denunciation of it; but men who are otherwise trustworthy will keep the inculpating facts to themselves, when it will save their comrades or their subordinates from censure. Even the division superintendent would prefer to have an accident on his division attributed, in the blasphemous language of the law, to an "act of God" rather than to a neglect of man; although he may not be unwilling to know the truth or to admit it when known.

The late lamented Pinkerton, to whom it had happened to inquire into an immense number of accidents at misplaced switches, once told us that the employés and the officials of the railroads almost always believed, or assumed to believe, that such an accident on their road was the deliberate work of an outside miscreant; but that he had rarely failed to prove, after due investigation, that the fault was in the neglect of some person whose duty was connected with the switch, or that it was faulty in construction or in bad order. Indeed, he had almost become convinced, by his numerous experiences of this kind, that a switch accident could not be due to any but an employé.

It is probable that there is no officer in charge of the affairs of any corporation who does not think it would be of value to him to be well informed as to the real causes of any accidents which occur upon his line; there are doubtless many who think they do arrive at them now as a general result, and others who think that it is not worth while to incur any expense after an accident in inquiring about it: "No use to cry for spilt milk!"

We are sure that the confident ones are mistaken unless they have taken more than usual pains; and as to the expense of more careful inquiries after the facts, of course they must cost something, although more in labor and in patience than in money.

The superior results of investigations carried out by the independent bodies of which mention has been made have led us to believe that a fairer spirit is necessary to arrive at the facts than often prevails with those who are generally called upon to report them to the manager of a railroad. It has seemed to the writer that the better results were due chiefly to the entire absence of prejudice or of personal interest with which the detective, or the Railroad Commission or the Board of Trade inspector could enter upon the inquiry; having also advantages which the railroad official has not, as time enough in which to follow each indication, freedom from all responsibility as to how it may turn out, and no previous acquaintance with the persons concerned, which would influence his judgment.

Perhaps something like this impartiality might be secured for the investigations which are undertaken by the railroads for their own information, by the appointment of a *judge advocate* to conduct them, who should have no connection with the operating departments of the road, and no authority except to summon witnesses; with leisure to take as much time as may be necessary, and with orders to report all the facts as he finds them, with his conclusions, to the chief executive officer of the company.

There are many other duties which an intelligent officer of this kind might attend to in the intervals between these examinations, and we conceive that he would be of great service to the executive in making desirable inquiries upon all sorts of economic questions which no chief officer can find time to make for himself.

We do not know of any road which has created an office of the kind we have described, yet we think we know of many upon which it would be extremely useful.—*Railroad Gazette.*

ENGLISH FALLACIES ON THE AMERICAN RAILWAY SYSTEM.

THE world may be going through a commercial revolution the effects of which are felt by mankind, while the causes remain in obscurity, now puzzling the profound and experienced, to come to light in due course, when all will be revealed. No one can point to a general industry which has escaped, and the most industrious of the communities have suffered most. Over-construction, over-production, bad management, dishonesty, etc., are alleged against this or that branch. One nation has been reckless in speculation, another in construction—England building too many ships, America too many railways. Some countries have produced too much corn, some too much sugar, some too much rice, tea, cotton; Manchester has darkened the horizon with its mantle of cottons, Pittsburg has worked up its iron out of proportion to demand. We are told that there is too much of everything. Mark Lane is glutted with wheat, Mincing Lane with all the products of the world. The docks are overflowing with wine, tanks are overflowing with petroleum; everything overflows but buyers. A walk through the city presents empty streets

and offices to let on all sides—above, below, many boards; —the walls are placarded; at every few paces a selling-off shop is passed. What is true of London is true of Paris, of New York; and if true of these capitals, what is the condition of the centers of particular industries, places which live on a trade which seems to have taken unto itself wings and flown away?

Under such circumstances the largest, most industrious and newest of the industries, no matter where placed, would certainly suffer most, unless managed with the utmost caution, and such management cannot be claimed for the railway system of the United States. No other could suffer to a like extent, because no other can compare with it in magnitude—the American network being the vastest, most costly: and doing more business, employing more hands and handling more money than any other national industry anywhere else. The shrinkage would suffice so far as mere figures go, to supply a great country with a railway system. All the rails in Russia, in India, indeed in all Asia, the largest of the continents, might be laid on the sum which represents the decline, and were the rails of American over-construction taken up and bodily transferred they would duplicate every road in Asia and leave a road or two for Persia. As the world has contributed the means, the loss is widely distributed, and the sufferers when they desire something away from home to abuse, can raise a chorus of complaints. The American railway system and management have been attacked right, left, and center; till in Europe the inability of finding any other investment alone prevents crowds from selling out in despair. Some sell first and then come face to face with the question "what to do with the money." India is a country essentially unsafe. The Russian cloud, long gathering on that frontier, is all the more to be dreaded, because the advance is slow. A permanent conquest of India has to be preceded by a deliberate movement onward, step by step; a subjugation of wild tribes, a disciplining of those which are to form the rank and file for the invasion, the incitement being plunder—a great division of spoil. The inroad when it comes will be a root and branch affair, with arms bare and red with blood, and what sort of a chance does the investor stand in a scene of carnage and confiscation? England may organize horde against horde, repel the invasion and roll the tide of war over the Russian conquests, but prudent investors prefer not to take such chances. It is enough that within a generation that war is next to certain. When the investor turns to the colonies he finds all overloaded with debt—all on the borrowing tack, all staving off the day of reckoning by fresh loans, yet money is cheap in the large towns and trade stagnant. Whatever good investments the colonies present are largely appropriated by the colonist, and the British investor gets what the man in the colony with money at command rejects. Glance then at any continental nation; at France about which economists calculate how long the nation can bear her load, when will be the great collapse; will it come in a general commercial panic, or in the smoke of war? What is true of France is true to some extent of every other continental community and over all hangs the insecurity of strife—it may be revolution; it may be nation against nation. Disheartened and weary of the search abroad, on turning back again to look for a safe place for his money, the investor finds little to cheer him at home. His railway securities are at such prices that they yield little more than do consols—nor are they of a class which an American investor would touch, except to sell as a "bear" till he knocked off half. Always growing in capital out of proportion with the increase in property, they seem like the colonial and other governments, to be inevitably if slowly approaching the goal reached by all in the end who spend more than they receive. English railway securities in Wall street, left to find the value a close investigation might reveal, would be torn to shreds. The "bears" would rush in as to a jubilee and dance on them. Their credit would quickly be lost and with it their borrowing power; they would come down by the run to "hard pan," and soon present the appearance—some of them—of cocks stripped of their plumage; and with a good deal of the crow taken out of them. The British investor does not sufficiently realize the difference. He did not understand a somewhat similar position in the case of the National bonds, and the railway case is far more complicated. But let him always keep this fact in mind as the key: Whereas, English railway securities are locked up in English strong boxes—a close borough—American railway securities are afloat on all markets and are the football of the wildest and most reckless "bear" den (Wall street) in the world. This wide scattering helps the operator, so that all the conditions favor the attack. But, asks the investor, what harm can such attacks do if the railway is really sound and well managed? In this age of credit, when the expenditure of costly enterprises is generally in advance of receipts—when even this government has to borrow for current expenses, what would happen if the borrower suddenly lost all power of borrowing, just, too, when he was committed to a large expenditure. Say the Underground Railway with its extension through the city on hand, was by some occurrence deprived of the ability to sell or borrow, what would the position be? All its receipts would perforce go to pay labor and before the works stopped the dividend would vanish. The "bears" on that, point triumphantly to the result, raising the chorus "I told you so." The position is disguised under a cloud of leaders and explanations, meanwhile the broad fact stands out that the line is bankrupt. This has happened in every case in America in which the railway has fallen into the hands of a receiver, while the position is darkened by the lies they tell and by the explanations. To our mind the broad condition is the only simple straight path—the one we can all see and comprehend, and it would be well for those lost in the maze, to get back to first principles and this starting point. The United States comprise the fairest part of the most favored continent. Its transportation is almost all by rail; an increasing fifty-five millions of people use this rail and raise more per head for carriage than other peoples—the transportation, therefore, is prodigious and the system is prodigious. Nothing can be substituted for the rail, so far, at least, as mankind now knows; therefore on this basis rests almost the means of existence of these fifty-five millions so peculiarly well-placed. Yet to draw the inevitable conclusion from the articles which constantly appear in English journals and periodicals, that system, the greatest industrial network ever formed, is only a gigantic fraud—some hole-and-corner patchwork, managed by dishonest and incompetent men. To state the case, is to show its absurdity; but its scope is not generally understood in an island having sea

ports all round, which never can be so dependent on the rail. How then has the whole system fallen into the position it now occupies? Suppose another piece of land, similar to England, but in a state of nature, were added. There would be an immense development, a large expenditure—settlers would rush in, towns be formed, railways constructed, and presently those most active in the work would be selling old securities to supply the means for continuing the construction. Suppose when committed to the work, some cause—a commercial crisis—interposed, stopped sales, demolished credit, and brought down on the heavily weighted, gangs of wreckers whose gain lay in their ruin. Then they would be in the position of those who had begun to build, but could not finish; and it matters not what the earning capacity of the incomplete thing may be when completed; neither an unfinished railway nor a roofless house is a paying concern. It would be urged that all the work accomplished, even in its crude state, was good, was in the line of profitable progress; that the present phase would pass, giving place to renewed activity; that the addition in population and wealth was a material gain to the whole country, etc. But we know by experience that after a set of writers have gone in for a full discussion of anything, only a return to the starting point can extricate the mass from the chaos. We are lost in the details in this explanation and that; but out comes the broad fact that a new county has been added to the island, that all is so much gain, even purchased at the sacrifice of the pioneer workers. And so with the American railway system. As a field for investment it is worth nearly all the world presents besides. It is the rising field; that which yields to the judicious investor the largest return, which places before him the greatest scope, which stands on the most secure basis—the well-being of the most prosperous of all nations; that which no disturbance can materially disturb, and one of the only things which may be said to be safe from the ravages of war, the owners of which cannot be removed or driven out. "Yes," said a British investor to the writer over a year ago, "no more American rails for me; I go into good home securities;" and he went. His good home security is now laid up in the Tyne, where it is likely to lay up for many a long day, and instead of dividends his good home security is calling up all it can scrape out of its ruined clients. Nobody here dreams of saying that the British navigation system is a gigantic fraud, though shipping may at this moment be in a state of depression which would make the American railway system seem prosperous by comparison.—*Anglo-American Times* (London, Eng.)

Petroleum as Fuel.

THE American Consul at Odessa recently made a tour of the Baku petroleum region, and he states that to his surprise he found petroleum used with a steam-jet as fuel on all the locomotives and on the steamers of the Caspian, the Volga and other rivers, and that experiments are in progress to utilize it on the new torpedo-boats now in course of construction at Odessa and at Nicolaeff, for the Russian navy. He says an American introduced the process, having obtained it in Pennsylvania. He says: "The oil is kept in at the stations and fed simultaneously with the water into that portion of the tender (inclosed) usually occupied by coal or wood. The fire in the boiler is started with a coarse, heavy grass, or wood, if near to Tiflis or Baku, until a pressure of about five pounds is obtained, or sufficient to work a steam-jet. The oil is then lighted, a flat jet of steam rushes out and carries the oil-jet to the end of the furnace, producing a strong, hot flame, which is easily regulated by the flow of oil, which is fed in very slowly, only a small quantity being required, and the tank on the top of the tender is sufficiently elevated to allow the oil to reach the furnace by gravity. I watched the apparatus closely, and found that a pressure of steam equal to that produced from a coal fire was maintained, and the absence of cinder and dense smoke made the hot, tedious journey over the Steppe much more agreeable, and at no time was the slightest odor of the oil perceptible in the carriage."

Electric Locomotive Head-lights in Austria.

A RECENT report forwarded from Vienna by Consul-General Weaver, states that recent experiments with Sedlaczek's electric locomotive head-light on the Western Railway have been pronounced by the public prints so successful that he begs to transmit a few items in regard thereto, which may prove of interest to American specialists. He writes:

"The conception of illuminating the railroad track by means of an electric light attached to the head of the locomotive has long since ceased to be a novelty in railway engineering, while the advantages to be derived therefrom, if successfully accomplished, have furnished sufficient spur to urge inventors to the greatest possible researches and endeavors.

"Success, however, has been rendered very difficult from the fact that the oscillations and jars of the engine while in motion soon destroyed the delicate apparatus of the best electric lights known, and that a cheap and convenient method of generating the electric current not immediately dependent on the continuous movement of the locomotive proved difficult to obtain. In 1881 Mr. Sedlaczek, chief of the telegraphic service at Leoben, in Austria, aided by Mr. Schuckert, of Nuremberg, after six years of trial, succeeded in obtaining, it is affirmed, these two great desiderata, first by adopting as generator a Gramme machine with a Brotherhood motor furnished with an automatic regulator, having likewise attached thereto a Schuckert dynamo-electric machine. To obtain sufficient current required from 700 to 800 revolutions of the electric motor, demanding about three horse-power, being less than 2 per cent. of the force of the locomotive; and second, the light was procured by a Sedlaczek lamp, invented specially for the purpose, having a force of 500 carcel jets. The electric machine was placed on the boiler, just behind the smokestack, and brought under the immediate control of the engineer.

"The first experiments took place in September of 1881, between Leoben and Judenburg, on the "Kronprinz-Rudolf Bahn," a distance of 50 kilometers, with great success, it is affirmed; to the end that the road for a kilometer before the locomotive was rendered light as day. The white signals were marvelously brought out upon the black background, and the lamps and lights appeared like yellowish points. The same experiments tried last October between Munich and Diesenhofen, of the Munich-

Salzburg line, resulted in even greater success, as may be seen from the official certificate of the President and Secretary of the commission of experts named by the Munich Electric Exhibition, a copy of whose translation accompanies this communication."

English Comment on American Statistics.

THE annual report of the United States Bureau of Statistics, says the London, (Eng.) *Railway News*, gives some interesting facts, as showing the enormous magnitude of the internal commerce and the consequent field for railroad enterprise. It is shown that the value of the products of the various industries of the United States is seven times the total value of the foreign commerce, nearly three times the total value of the foreign commerce of Great Britain and Ireland, and five times the total value of the foreign commerce of France, including, in each case, both imports and exports. The total value of the products of industry in the United States is also shown to be a little more than twice the total value of the exports of merchandise from all the countries of Europe. The United States is now the largest manufacturing country on the globe. The value of products of American manufactures consumed at home is five times the value of the manufactured products of Great Britain and Ireland exported to all other countries, and more than fourteen times the value of the exports of manufactured products from France to all other countries. The relative value of the internal, as compared with the foreign commerce of the country, is also illustrated by statements showing that 99 per cent. of the coal mined in the country, 95 per cent. of the iron and steel products, 95 per cent. of the products of the leather industry, more than 99 per cent. of the manufactures of wool, 95 per cent. of the products of cotton manufactures, more than 99 per cent. of manufactures of silk, and 97 per cent. of manufactures of glass, glassware, earthenware and stoneware are consumed in the United States.

All-rail Route from England to India.

A PROJECT for establishing a virtually all-rail route from London, England, to Bombay, India, is published. The proposed route is via Tangier, through Morocco, where it would make a junction with the Algerian lines, afterwards continuing by Tunis and Tripoli to Cairo. Thence the line would continue along the Euphrates valley and the shores of the Persian gulf to Kurrachee, the extreme westerly point of the Indian railway system. The cost would be about £10,000,000. Quick trains, three of which would be run weekly each way, would cover the distance between London and Bombay in nine days; while slower trains starting daily would take a day or two longer. The only breaks in this extremely elongated line would be the English channel and the straits of Gibraltar.

Bessemer Steel Works in the United States.

ACCORDING to the *Scientific American* there are 21 Bessemer steel works in the United States, and 2 in process of building. These 21 works contain 46 converters, and 3 converters are building. The total annual capacity of the works completed is 2,490,000 net tons of ingots. The plant building is that of the Benwood Iron Works, at Benwood, W. Va. The States that have Bessemer works are: Massachusetts, one, with two 4 ton converters; New York, one, with two 7 ton converters; Pennsylvania, nine, with twenty-two converters and one building, ranging in size from 2 to 10 ton; West Virginia, one, with two 5 ton converters and one building, which will have two 4 ton converters; Ohio, three, with five converters, ranging in size from 4 to 10 ton; Illinois, four, with nine converters, ranging from 6 to 10 ton; Missouri, one, with two 7 ton converters; Colorado, one, with two 5 ton converters.

The first Bessemer plant in the United States was erected in Troy, N. Y., and made its first blow February 15, 1865; the second was erected at Steelton, Pa., and made its first blow June, 1867; the third was erected in Cleveland, Ohio, which made its first blow October 15, 1868. The largest Bessemer plant in the United States is that at Steelton, Pa., which contains two 7 ton and three 8 ton converters. The next largest are the Edgar Thomson, at Pittsburgh, and the North Chicago, at Chicago, which have three 10 ton converters. The domestic works are now more than able to supply all domestic demands for Bessemer steel, and one of them recently received a 10,000 ton order from Canada for rails.

British Rail Exports.

FOR November and the eleven months then ending Great Britain has exported rails to the United States and to all countries, in tons of 2,240 lbs.:

To the United States:

	November.			Eleven months.		
	1882.	1883.	1884.	1882.	1883.	1884.
Iron rails.....	....	....	....	21,127	2,593	7
Steel rails.....	4,636	6,702	1,007	167,142	63,579	17,476
Total.....	4,636	6,702	1,007	188,269	66,162	17,483
To all countries:						
Iron rails.....	2,014	1,913	1,305	44,722	23,913	13,836
Steel rails...	52,292	57,488	33,216	687,416	695,905	493,398
Total..... ..	64,306	59,401	34,521	732,138	719,818	507,234

The exports to this country were insignificant, as they have been throughout the year. To other countries they were 36 per cent. less than last year and 43 per cent. less than in 1882 in November, and for the eleven months they were 489,751 tons this year, against 653,656 tons last year, 543,869 in 1882, and 391,383 in 1881. Of the entire decrease since 1882, 170,786 tons are in exports to this country, and 54,118 in the exports to other countries. The exports to other countries were much larger this year than in 1881.

The Iron and Steel Trades in Russia.

FOR the purpose of fostering the native metallurgical and engineering industries in Russia, the State has since 1876 offered premiums on the manufacture of such articles as steel rails, locomotives, railway-wagons, &c. The sums received by manufacturers since 1879 are given as follows: 1880, 2,929,051 roubles; 1881, 2,039,515; 1882, 1,034,787; 1883, 748,487, while for 1884 the amount is estimated at 1,950,000. On rails completely manufactured in Russia before May 14, 1885, the Government offers a

premium of 35 copecks per pound (about ⅔ cent per pound). On the rails manufactured only in part in Russia 20 copecks per pound are offered until May 24, and 15 copecks after that date. The aggregate output of the rolling-mills during 1885 is expected to reach 5,080,000 pounds (91,440 net tons).

Railways in the Argentine Republic.

THE Transandine Railway was completed, as has been already announced, as far as Mendoza on May 25 last, and by the end of the year it will probably have reached San Juan, which commands one of the principal passes of the Cordilleras. The Western Argentine line will then be completed. The Northern line is also very advanced, and will shortly reach Salta, close to the Bolivian frontier. The roads of secondary importance are also being vigorously pushed forward, and Buenos Ayres has been connected on the one hand with Santa Fé and on the other with the Northern Railway. The railway-works now in progress in the Argentine Republic are, it is said, occupying more than 10,000 men.

The Fast Locomotive of the Future.

TIME is money, remarks the London *Engineer*, and it may be in the coming years that a demand will arise for a faster means of transit than that which we possess at present. How can we meet it? With our railways laid out with curves and gradients existing, and with our national gauge, and our present type of locomotive, no great advance in speed is very probable: the mean speed of express trains is about fifty miles an hour, and to take an average train of 200 tons weight at this speed over a level line requires between 650 and 700 effective horse power, within the compass of the best engines of the present day. But, if instead of fifty miles an hour, seventy is required, an entirely different state of things obtains. Taking a train of 100 tons, with engine and tender weighing 75 tons, or 175 tons gross, the first question to determine will be the train resistance. With reference to this we want careful experiments. The long and heavy bogie, Pullman and other coaches, have the reputation, rightly or wrongly, of being hard to pull. The resistance of an express train on the Great Western Railway at seventy-five miles an hour was 42 pounds per ton, and taking 40 pounds per ton for seventy miles an hour would give a total resistance on the level of 7,000 pounds, corresponding to 1,400 horse power—about double the average duty of an express engine of the present day. The weight on the driving-wheels required would be 18¾ tons, allowing one-sixth for adhesion. Allowing 2⅛ pounds of coal per horse power per hour would give a total combustion of 3,500 pounds per hour, and to burn this even at the maximum economic rate of 85 pounds per square foot of grate per hour would require a grate area of 41 square feet and about 2,800 square feet of heating surface. Unless a most exceptional construction combined with small wheels is adopted, it appears almost impossible to get this amount on the ordinary gauge.

It is true the Wootten locomotives on the Philadelphia and Reading Railway have fire-boxes with a grate area of as much as 76 square feet, but these boxes extend clean over the wheels, and the heating surface in the tubes is only 982 square feet; but although these engines run at a speed of forty-two miles an hour, they are hardly the type to be adopted for such a service as is being considered.

The whole question of the future introduction of trunk lines, exclusively for fast passenger traffic, is fraught with the highest interest, but it would be foreign to the subject matter of this paper to enter more fully on it, the author merely desiring to state his opinion that if the future trade and wealth of our country require their construction, and if a very high rate of speed much above our present is to be attained, their gauge will have to be seriously considered and settled, not by the reasons which caused the adoption of the present gauge, but by the power required to carry on the traffic—in fact, to adapt the rail to the engine, and not, as at present, the engine to the rail. High speed requires great power, and great power can only be obtained by ample fire-grate area, which, for a steady-running engine means a broad gauge.

Two Points of a Car-wheel.

IT is stated that there is a point of the wheel of a car that touches the rail that does not move forward in the least, and an opposite point that moves forward twice as fast as the car. If the wheel is lifted up and revolved free, the lower point may be said, as to the axis, to move backward with the same speed that the opposite or upper point moves forward. But with the wheel on the ground and rolling bodily forward, this forward motion of the wheel's axis overcomes the backward motion of the lower point, and at the same time carries the upper point forward with double velocity.

THE Board of Railroad and Warehouse Commissioners of Illinois have completed their annual report of the railways in Illinois. The total length of these roads is given at 20,477 miles, of which 5,676 are in Illinois. The aggregate of main lines and branches is 31,059 miles, of which 9,141 miles are in the State. There were 117 miles of new road built in Illinois during the past year. The total amount of stock of these companies is given at $681,127,539, of which $519,136,245 is preferred. The amount held in Illinois is $11,684,450. The aggregate stock and bonded floating debt is $1,346,751,603. Cost of construction and equipment, $255,514,448.

THE success of the Pullman Car Company in its work of building up a model workingmen's city is evidenced by the results of a census of the city of Pullman, Ill., which just been taken. The census shows that the new city now contains 8,329 persons. There are 3,865 men, 1,799 women, and 2,665 children. Several hundred men work in Pullman who reside in Kensington and Roseland. There are now 12,000 people residing within one mile of Hotel Florence. The first family moved to Pullman on January 1, 1881.

FOUR Egyptian youths have entered the locomotive and telegraph department of the Midland Railway in England, with a view to qualifying themselves for railway positions in their own country.

A RAILWAY station recently finished in Birmingham, England, at a cost of two million dollars, is credited with being the largest railway station in the world.

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ANOTHER UNWELCOME VISITATION.

FOR the second time within the brief space of eighteen months the AMERICAN RAILROAD JOURNAL has been visited with a disastrous fire, destroying many valuable records and papers and delaying its issue. The November JOURNAL was on the verge of going to press, already some days behind time on account of a slight delay in obtaining the reports of the Street-Railway Convention, when in a few hours chaos reigned supreme, and the greater part of the work had to be done over again to repair the damage caused by the fire.

To a young publication, just starting on its career, such a catastrophe would doubtless be most discouraging; but the JOURNAL is fifty-four years old and has been used to set-backs. The November JOURNAL was issued with all the rapidity possible, late it is true, but none the worse for the delay. The files of the JOURNAL extending back to the period of the construction of the first hundred miles of railway in this country, and presenting the most complete history in existence of railway progress in America, were fortunately preserved; and we shall continue our task of furnishing the railway world with a monthly magazine and review, undisturbed by the catastrophe, and calmly awaiting a third visitation if Providence so ordains.

Meanwhile we would call attention to the fact that with the current issue, the JOURNAL has published in all since its change in management, thirty contributed articles by well-known writers, and is content to await a verdict as to its usefulness. With the commencement of the year 1885 our energies will be redoubled, and every indication points to an early recognition of the JOURNAL as the literary exponent of the American railway system. There may not, perhaps, be much poetry in railways, but there are a number of vital problems connected with their management that can best be treated in a chatty, discursive and literary fashion, and this the JOURNAL proposes to do, while at the same time omitting nothing from its columns that would be of interest to its large and increasing number of readers.

"CORPORATION JUDGES."

IT is a common practice—much too common it strikes us—to speak of certain members of the judiciary as "corporation judges." The term is either used as a reproach or as a commendation, and in either sense it speaks ill for persons to whom it is applied. A corporation in litigation, is, or should be, recognized as an individual solely, subject to the same restrictions and privileges appertaining to a simple citizen. To suggest that a judge upon the bench lends either a willing or a reluctant ear to the pleadings of a corporation *as a corporation* is an insinuation that either on the one hand he is a friend to aggre-

gated wealth as represented by the corporate interests involved, and unfaithful to the welfare of the people, or else, on the other, that he is permeated with the socialistic theory that corporations have no privileges which are worthy of recognition. In either case we should infer that such a judge was unfit for the proper exercise of judicial functions.

There is a right and wrong to every case, and while different interpretations may be put upon the law by different judges, this difference should not arise through partiality or hostility to corporations as such. Such action must be open to the just charge of corruption or demagogism as the case may be, and so far as the interests of railways are concerned, we deplore the use of terms indicating a judicial bias in one direction or the other. The act of incorporation is a simple act by which generality becomes individuality and there should be no difficulty in applying the same rulings to a railway company as to the single proprietor of a railway if such were to be found; and yet an idea has gained currency that corporative litigation is of a character different from that between two citizens. Indeed lawyers themselves are prone to recognize this distinction, and the very judges are in no ways discomfited if this distinctive character is given to their rulings.

There is the law and there the parties to a suit. It matters little whether the sums involved be great or small, or whether the litigants be single or corporate. The judge has but one clear course open, and that is to interpret the law. If he leans to one side or the other he is unfit for his position.

All this is very trite, and we lay no claim to originality in enunciating these familiar truths, but when we observe certain legal gentlemen suggested for elevation to the judiciary on the ground of their especial usefulness to corporate interests, or opposed on the ground of anti-corporation rulings, it strikes us as time to say a word even if that word has been spoken more than once before. Speaking for railways, we should say that when they enter the courts they should do so for one purpose only—to obtain justice. If they seek favoritism they are pursuing a criminal course. We are aware that in many instances railway speculators desire almost anything but justice, and not infrequently they get what they want, yet we should hesitate to believe that in the abstract, a corrupt or biased judge would be favorably regarded by honestly-managed roads. Nor would such members of the judiciary be useful to railways in the long run. Granted that their rulings might be favorable, and that they might stretch a point or two in behalf of the corporation, there is nothing to hold them to that course. There is no principle back of such action, and if it be prompted by self-interest, the railways will sooner or later pay for it in some manner.

A correspondent has asked us our definition of the term "corporation judge" and it is chiefly in reply thereto that we have spoken as above. Our definition is simple enough and may be summed up in a few words. A "corporation judge" is a member of the judiciary who, through selfish interests or through corrupt influences, lends the weight of his judicial opinions and rulings to the furthering of the schemes of corporations, regardless of justice and the right. That, we opine, is about the size of a "corporation judge."

A NOBLE RECOGNITION OF THE CHRISTMAS SEASON.

IT is gratifying to note that with the advent of the gladsome Christmas season the hearts of railway officials are warmed into love for their fellow-men, and, as usual at this period of the year, we are constantly informed by means of the newspapers that the officers of certain roads have given turkeys and plum puddings to their entire force of employés. Such acts of philanthropy are indeed pleasant to contemplate, and doubtless the appetizing turkey will dwell in the memory of the employé as a grateful reminder of the kindness he has experienced at the hands of his employers; but this year we hear for the first time of an act of genuine benevolence on the part of a Canadian railway official that fills us with unspeakable admiration. The gentleman in question was an ardent disciple of Mr. HENRY BERGH, and even carried his love for animals to such an extent that he became warmly attached to the "iron horse" as the locomotive is poetically called. A few weeks ago, when the question arose as to the usual Christmas donations to the faithful servants of his road, he declared before the Board of Managers that the faithful and uncomplaining locomotives should not be without recognition, and announced his intention of furnishing them with a Christmas banquet at his own expense. In accordance with this generous resolution all the locomotives of his road, numbering forty or more, were drawn up in the round-house at the main terminus, and under the supervision of a force of competent train-hands were treated to a lavish banquet of coal and water.

The impulse which prompted this philocomist to furnish the carbon-hydraulic banquet is worthy of the highest praise; but unfortunately through ignorance as to the exasperating and unreasonable character of the average locomotive, the feast was not an entire success, and certainly was not characterized with the good-will and fellowship which properly appertain to a Christmas banquet. As soon as the locomotives were brought into the banquet hall dissension arose. The highly-polished and cultivated passenger-locomotives refused to hold

any intercourse with the freight-locomotives who, in turn, stung by the slight, looked down contemptuously upon the humble drilling-engines. This clannishness for a time cast a damper over the festivities, but, gradually warmed by the cheerful coals, much of this frigidity disappeared, and all would have terminated pleasantly had it not been for the presence of a few dissipated locomotives, who, obtaining more than their share of the viands became flushed with steam, and highly argumentative and obstreperous. Two locomotives in particular, Nos. 19 and 34, became engaged in a dispute as to their relative capacities for speed, and ultimately this dispute broke up the festivities. At first the two engines contented themselves in bandying epithets and consigning their individual parts to perdition. A few phrases, such as "Smash my Head-light!" and "D——n your Pilot!" passed between them, when, after a peculiarly exasperating taunt made by 34 as to the unsteadiness of 17's wheels, 17 deliberately dealt a stinging blow upon 34's cylinder-head, crushing it in and enveloping the room in a cloud of steam. Instantly the whole assemblage was in an uproar. Raising its connecting-rod, 34 completely demolished 17's cab, and with mingled shrieks and curses the two locomotives, maddened by the fumes of steam, grappled in a deadly embrace. A timid freight-engine, unused to such scenes of carnage, rushed wailing through the side of the building and dashed for the woods. The remaining engines, already overcome with the mellow steam, endeavored to find the rails and retire in good order, and in a few minutes the banquet-hall was deserted by all save the two combatants who with crushed boilers and quivering steam-chests lay expiring upon the floor.

An alarm was sounded and an active search made for the missing locomotives. Several were found in an adjacent ditch groaning with bruises, while others had taken to the woods where they were found entangled in the underbrush, one terrified locomotive having climbed a tree to reach a haven of safety. Several had managed to stick to the rails, and telegrams continued to be received from points along the main line, announcing the arrival and capture of panting and terrified locomotives. They were gradually collected and calmed down, and after a short interval the remains of the two obstreperous engines who had brought about the panic were tenderly removed to the scrap-heap. But it was reluctantly admitted that the Christmas banquet was not a success.

Still, the benevolent official has no reason to regret his generosity. It is by our intentions that we are judged, and certainly no loftier charitable deed can be recorded than the locomotive banquet. Let the giver take heart, and when in years to come, the locomotive having become accustomed to the usages of polite society, this species of banquet forms a regular feature of the railway Christmas, then indeed will he receive his rich reward in the veneration paid him as the Patron Saint of American Locomotives.

EDITORIAL NOTES.

IN the confusion attendant upon our recent fire, the November JOURNAL went to press with an error in paging that was not discovered until it was too late to correct it. Instead of the pages being numbered from 225 to 256 inclusive as they should have been, these numbers were passed over, and the pages numbered from 257 to 288. The error having been committed, we shall continue to number the pages of the JOURNAL from the November issue, rejoicing in the fact that at any rate our readers have not been cheated out of the absent thirty-two pages. If at a future time we are asked what these missing pages contained, we can with truth answer: "The contributions that we were unable to find available."

* * *

NO one will regret the departure of the year 1884. It has been a year of turmoil and confusion, in which a Presidential election, a financial panic, an earthquake, and a number of lesser disturbances have taken place; and we turn with a wearied sense of relief to rest our shattered nerves in the months of 1885. May it be a more cheerful year in every respect than its predecessor is our heartfelt desire and prayer.

* * *

REGARDING railways in particular, 1884 has not been a particularly bright year. When it was scarce two days old the railway world was startled by the announcement of the downfall of one of its greatest magnates, HENRY VILLARD, and ever since it has been a period of receiverships and passed dividends. The construction and opening of new roads have been inconsiderable, and trade generally has been abominably dull. Away with it! Let it be buried in the past as an epoch that affords no satisfaction in retrospect.

* * *

THE annual report of the New York, West Shore and Buffalo Railway as made to the Railroad Commissioners of New York State, shows: Capital stock (all paid in), $40,000,000; funded debt, $70,000,000; unfunded debt, $9,339,632; cost of road and equipment, $99,027,121; earnings, $2,979,331; charges against earnings, including $2,604,581 interest, $6,693,360; deficiency for the year, $3,714,029. The road carried 1,360,608 passengers and 839,539 tons of freight. The future career of this singular road will be watched with interest, and the comments on its first official showing since it passed into the hands of a receiver will provoke widely different comment.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

STREET-RAILWAYS AND THE "PROPERTY-OWNER."

THE percentage of street-railways built without vigorous opposition from one quarter or another is very, very small. As a general thing, a road can only acquire an existence and reach the point of active operation after a tedious legal tournament, in which it has had to fight inch by inch for the privilege of laying its rails and running its cars thereon.

If on the face of the globe there chanced to be a civilized country where street-railways were not in general operation—and we have yet to hear of such a country—and if one of the citizens thereof should be asked to state whence he thought this opposition to the construction of street-railways arose, he would undoubtedly reply; "From persons remote from the line, who are naturally anxious to have it constructed in an avenue more convenient for them." Poor deluded stranger! Little would he imagine that the reverse is the case, and that the chief opposition to the construction of a street-railway comes from the property-owners and residents along the proposed line of the road. Strange to say, the people who are to reap the greatest advantages from the road, the people whose property will increase in value through its proximity to a street-railway, are the very people who seek to hamper the project with countless law suits.

It is safe to assume that these same people, after the road has been built, in spite of their unreasonable opposition, will become its chief patrons, and will grumble extensively if their wishes, as residents along the line, are not deferentially considered. They will not deny that the road will be a source of great convenience; that they will patronize it extensively when completed, or that they have frequently been put to considerable difficulty on account of the insufficiency of the street-railway accommodation in their neighborhood; but the simple fact that they are property-owners and thus in a position to bring a suit for injunction restraining the company from laying its tracks, seems to act as an incentive to the exercise of this inestimable privilege. The favorite argument employed by them is to the effect that the proposed road will injure the street. Of all absurd and inconsequential arguments, this ranks deservedly at the front. It is true that there are some narrow streets where the local traffic is so great as to render a street-railway a hindrance to travel, but their name is not legion, and this issue is rarely the one at stake. If the avenue were a mile wide the property-owner would be as rampant as ever. It is equally absurd to claim that the running of street-cars injures the appearance of a street and robs it of its "tone," for a street-car is every whit as handsome an object as a stage or omnibus, and omnibus and stage-lines are not subjected to this legal warfare.

It would really seem that this opposition arises from the fact that the property-owner perceives that certain capitalists seeking a profitable investment for their capital have found it in a street-railway. Of course this is an outrage and the property-owner is righteously indignant. He is perfectly willing to patronize street-railways and will even consent to pay a modest fare thereon, but the owners of the road have no right to expect a return from the money invested, more especially if their road touches the sacred precincts of his property. If the road must be built—and the property-owner is sometimes sufficiently noble and unselfish to admit that the road might be a great convenience to him—very good. He will not stand in the way of its construction—only it must be understood that the stockholders must either buy their franchise at an enormous outlay of capital or else pay a large percentage of the gross receipts of their road into the city's treasury. In either event the amount must be sufficient to preclude all possibility of there being any dividends to the presumptuous stockholders.

In reaching this conclusion as to the animus which prompts the property-owner to oppose the construction of street-railways in streets on which his property fronts, we thought we had solved a great mystery, but after a little reflection we must confess ourselves baffled once more. If this conclusion were correct why should not this opposition also be manifested against the afore-mentioned omnibus and stage-lines? In this connection we might with reason look for even greater opposition, for proprietors of stages and omnibuses are put to far less expense in getting their lines in operation. They have no tracks to construct and keep in repair, and the amount of capital invested is far less than in the case of street-railways. With this fact in view it would be fair to assume that the opposition of the property-owner would be far greater in the case of a stage-line than in that of a street-railway; yet, inconsistent as it may appear, stages are licensed and run through populous streets and avenues without a single word being heard in opposition from the property-owner.

Take it altogether the property-owner, when considered in his relations to street-railways running past his property, is a strange being and he affords a most interesting study. We are tempted to offer a prize for the earliest and most satisfactory answer to the following query: "Why does the property-owner oppose the construction of street-railways that will enhance the value of his property and greatly add to his comfort and convenience?" An acceptable answer to this inquiry would certainly afford us great satisfaction, and relieve our minds from puzzling over a wonderful example of inconsistency.

NOT wholly unexpected, several letters have been received expressing regret at the titular change in this department, and informing us that we were unwise in dropping the word "tramways," which formerly stood at the head of these columns. Like our correspondents, we are not without a feeling of regret at the change, but our regret is of a different character. The American Street-Railway Association, through its officers and executive committee, having requested that the change be made, we were glad to comply with the request, since we regard the Association as the national authority on questions of street-railway expediency, and we do not regret our course. What we do regret is that the word "tramway," superior in every way to its American correlatives of "street-railway," "surface-road" and the like, has not met with general adoption. That we are not alone in this way of thinking is evident from the receipt of the letters in question, and we assure the writers thereof that it will give us great pleasure to reinstate our former titular heading when "tramway" comes into general use. That it will do so we firmly believe, in the same manner as "railway" is fast superseding "railroad;" and sometime in the future we expect "tramway" to receive the endorsement of the American Street-Railway Association. Until that time, however, we shall continue to employ the term "street-railway" exclusively in this department of the JOURNAL, and only give place to these few remarks as a final explanation of our position.

* * *

THE remaining reports of special committees submitted at the recent street-railway convention are printed in full in this issue of the JOURNAL. They are on the subjects of "Stables and Care of Horses," "Electricity as a Motive Power," "The Cable System as a Motive Power," and "A Uniform System of Accounts."

* * *

IN our last issue we erroneously gave the date of the next convention of the American Street-Railway Association as October 14, 1885. The correct date of the fourth annual convention is October 21, 1885, and it will be kept standing in a note heading the columns of this department.

STREET-CAR HEATING.

BY A RETIRED OFFICIAL.

[Written for the AMERICAN RAILROAD JOURNAL.]

DURING the latter years of my active street-railroading days, a period not very far distant, the question of the heating of street-cars in Winter had just become the chief problem for street-railway managers to consider. Cable roads and electric motors were then unknown and street-car heating towered above all other problems demanding a solution. I well remember the argument we street-railway people used to employ to dismiss the subject, and I fear it is still a favorite argument with those managers who are anxious to avoid the introduction of heated cars upon their lines. When "laymen" used to approach us with the query, "Why don't you heat your cars?" we would reply in an off-hand, careless manner: "Pshaw! if we heated our cars the public wouldn't ride in them. They would find them so intolerably close and uncomfortable that they would gladly welcome the return of cold, fresh air." And what is more, we had the hardihood to reply thus while sitting in our comfortable offices and gazing out upon our frost-nipped patrons traveling in cars where the temperature was down in the "teens," and sometimes lower. Since my retirement from active railroading, and since I am now a patron of street-railways myself instead of a grasping official, I have come to think differently, and on cold, frosty mornings, when I am suffering in an ice-box on wheels, I have hurled anathemas at my former self for giving utterance to so silly and baseless an argument. The people *do* want warm street-cars, and sooner or later they will have them.

It has been practically demonstrated that the heating apparatus can be placed in a street-car with such an eye to economy of space that but a single seat is lost. Therefore the argument of lack of space has no foundation. Regarding the question of ventilation I think it is evident that a street-car, both of whose doors are frequently opened while the vehicle is in motion, is subjected to a ventilation that will entirely change the air a dozen times each trip; so I hold the argument of "closeness" to be equally unfounded. It must be remembered that the prevalent desire is not so much for a warm car as it is for a car that is not cold. A temperature of 68 or 70 degrees Fahr., which is generally thought comfortable for an ordinary apartment, would be too warm for a street-car in Winter, where the passengers were warmly clad with overcoats and furs. A mean temperature of from 55 to 60 degrees would be ample, and this can be obtained without subjecting the occupants of seats near the heating apparatus to the slightest inconvenience. Regarding the expense of heating street-cars, it has been clearly demonstrated that it can be done at a cost not exceeding twenty or thirty cents per day for each car, and for even less; so on the grounds of space, comfort and expense no valid arguments can be made against street-car heating.

That there may be other objections, no one will deny. In fact it was not niggardliness nor even economy that prompted us to dismiss the question in my day, but rather a perplexity as to how the heating could be accomplished. The street-car stoves and heaters of those times were very different from the compact little heaters of the present day; but even with the latter I can well

understand that it is a considerable trouble for the conductor to keep the heater in good working order and always at the proper temperature; and before street-car heating becomes universal some other apparatus than a coal-stove must be employed. Considering the brevity of the ordinary round-trip of a street-car, it would seem possible to introduce a very satisfactory system of heat-storage, either by means of hot air, hot water or steam. The supply could be replenished at the end of every trip and the car rendered comfortable in the coldest weather. It would also seem possible to employ the gas-stove as a means of heating, and this would at any rate have the advantage of requiring no looking after. Ordinary gas-stoves, burning eight or ten feet of gas per hour, are sufficient to heat, to the verge of closeness, an ordinary apartment; and a street-car could be kept at a comfortable temperature by means of one at a cost not exceeding two or three cents per hour, or even less, varying with the cost of gas in different localities. It would certainly be an easy matter to store a sufficient quantity of gas in a small gasometer to keep a steady supply on hand in each car.

I do not pretend that any of these suggestions are strikingly novel, for they have probably occured to every progressive street-railway superintendent in the country; and I do not think the latter are to blame for the absence of heated cars. The difficulty, I take it, is not so much that the heating of street-cars is not popular; that it is expensive; that it requires too much room, or even that it is impractical. The trouble is to make the necessary structural change in the car without interruption to travel or injury to the car itself. The question of street-car heating is really a matter more for the car-builders to consider than the company's officers. As a rule, cars are built without reference to a method of heating, and while the expense and trouble of the heating itself may be very slight, the expense and trouble incurred to put the apparatus in position for effective operation is considerable. I have often wondered why the car-builders appeared to give the subject so little attention, leaving the poor street-railway officials to puzzle their brains over the ways and means, when street-car heating is a question directly connected with the structure of the car. If the builders would only exercise their ingenuity and provide cars with a heating apparatus that at once answers all the requirements and possesses the virtue of rapid adjustment for operation, I am confident that the number of heated street-cars would multiply with amazing rapidity. In the end they will have to consider the question, and that builder who enters vigorously into its practical consideration will receive a richly-deserved reward.

In the meantime the public do want heated street-cars, and the various roads are coming to this conclusion. There is no more reason why a street-railway traveler should freeze than a traveler upon a steam-railway, and the question of street-car heating will continue to possess a lively interest until the problem meets with a satisfactory solution. In the case of newly-built roads with new cars, there is certainly no reason why these cars should not be constructed with a view to a system of heating being employed; and when the street-railway companies and the builders are both engaged in the consideration of the vexed problem, we may look for greater results than have yet been reached,

THIRD ANNUAL CONVENTION
OF THE
AMERICAN STREET-RAILWAY ASSOCIATION.

Reports of Special Committees (concluded).

REPORT OF COMMITTEE ON STABLES AND CARE OF HORSES.

THE AMERICAN STREET-RAILWAY ASSOCIATION:—

Gentlemen—The Committee on Stables and Care of Horses, submits the following:

The importance of information upon this subject is shown by the fact that nearly two-fifths of the investment in street-railways is in buildings and horses; and of the expense of operating, upwards of 35 per cent. is consumed in the maintenance of stables and horses.

The care which the horse receives at the hands of the managers of street-railways has much to do with the economy of operating; for it is evident that well-arranged stables, careful attendants, and skillful drivers, with wholesome and sufficient feed go a great way towards prolonging the life and usefulness of the horse in street-car service.

The subject of stables naturally claims attention first, and in this connection it must be understood that, at least, eighteen and, perhaps, twenty hours out of every twenty-four, the horses in this service are confined within the stables year in and year out. Thus three-fourths of the life of the horse is spent in the stable. Considering that plenty of light and pure air are essential to the healthy condition of the horse, to furnish this should be the first object in building a stable.

In selecting material, such should be chosen as will be least likely to absorb and retain the impurities, which will always be found within such buildings. Great care should be taken to have the drainage perfect, and if underground to have the drains so inclined, trapped, and tight in the joints, as to quickly and completely take away whatever is deposited in them. Arrangements should be provided to flush them often with water, and if possible to have all traps and catch-basins well ventilated, so as to carry outside of the stable any foul gases which may accumulate there. The theory of surface drainage for stables has many supporters, and deserves careful consideration from those about to build. If surface-drains are frequently flushed or washed, this manner of draining would seem to call for no objection. The matter of drainage being settled, the next question is light and ventilation.

Arrangements should be made to admit air in sufficient quantity without creating a draught.

Roof ventilation is desirable, but not sufficient, as the air of a stable containing many horses is heavy and will not rise without a current of air from near the floor to assist. Light can be admitted from high openings in the sides of the building, but these should not be depended upon for side-ventilation as the height renders them insufficient to move the air, and the location, usually over the heads of the horses, causes them to be dangerous as means of a draught.

Doors on opposite sides of the stable connected by a passageway running behind the horses, this passageway having ventilation from the roof, is a desirable means of ventilating a stable, as in case the wind blows too strongly in one direction the doors on that side of the building can be closed, while air is admitted from the opposite side.

As a matter of convenience it may be desirable to have all stalls upon the ground floor, but such an arrangement is not practical in large cities on account of the high cost of land, and horses may be as well established on the second or third floor, provided these floors are constructed properly as regards the drainage, and provided with "runs" leading to the outside in two or more directions to be used as escapes in case of fire.

The stalls should be constructed with a view to give the horse as much freedom as possible consistent with economy in utilizing the space. Experience demonstrates that the width should not be less than four feet in the clear, or the depth less than nine feet. The height of the partition between the horses should be at least four feet, and at the heads, carried three or four feet higher, in such a form as to admit light and air without allowing the horses to bite and otherwise annoy each other. Single stalls are preferable, although double stalls, with swing-bars between the horses, are in favor with many good stable-experts. The floor of the stall should pitch toward the gutter about one and a half inches to the nine feet. A good construction for stall-floors is to lay the surface for about four feet inward from the gutter with close-grained hard wood, like maple, in strips of four or five inches wide and two inches thick, leaving a space between, three-quarters of an inch wide, to allow the urine to pass off without being absorbed in the bedding.

The best form of manger or feed-box, is of cast iron, formed so as to have no square corners for feed to accumulate, and of sufficient depth to prevent the horse from "nosing" his feed out. No rack is needed for loose hay; this can be fed in small quantities from the floor. A passageway, say four feet wide, between the heads, or in front of the stalls for the purpose

of feeding is desirable; this should be ventilated by windows or doors at each end, and a flue leading to the roof above. The loft for feed should have a tight floor, so that the steam and ammonia from the stable underneath will not contaminate the provender stored therein. It should be constructed with windows to admit light and air from the sides, and with roof-ventilation at the top. Suitable receptacles should be provided for the manure *outside* the stable, and all refuse and manure should be removed frequently, and before it has had time to heat and steam.

The custom of building stables with cellars to receive the manure is not recommended; and unless there is yard-room enough to pile the manure compactly outside the building, it should be removed from the premises daily. The space allowed for rear floorway between the stalls should be sufficient to permit the removal of horses from one row without interfering with those on the other; for this purpose, ten feet is a fair allowance.

The plan of arranging stalls in sections, so as to have the horses allotted to the care of one man stand together, is a good one; also that of having a separate drinking-trough for his horses. If a common drinking-trough is used, it should be centrally located and supplied with running water.

Twelve feet in the clear is recommended as a good height for each story, although some advise more, and some are content with even less.

Arrangements outside the building to dry and air the bedding are very desirable when straw or hay is used, and if shavings or saw-dust, bins for storage should be provided. If any substance except wood is used for floors, bricks are recommended, as they are easily renewed when worn and less liable to cause the horses to slip than stone, asphalt or cement.

In coming to the subject of the "care of horses," it is suggested that the first care should be exercised in the selection of horses to be purchased. The theory that any kind of a horse that can be had for from $100 to $150 will do for street-railway use, is a bad one.

The buyer of street-railway horses has a somewhat difficult problem to meet from the fact that the horse most desirable to him, usually commands a higher price than he, *i. e.*, the corporation, however, he represents, is willing to pay. A good buyer will always insist upon the necessary qualities in the horse he buys, without too much regard to price. In the first place, only sound horses should be bought. Although horses unsound in some respects, *may* be used to some advantage, it is never best to buy them in that condition, as every railroad manager knows that the exacting labor they are subject to, will cause unsoundness in some form or another soon enough. A good disposition and easy gait should be considered as absolutely necessary. The head and general appearance of the countenance will show the disposition, and a trot of fifty feet, will show the gait. Color should have nothing to do in the selection except to cheapen the price, as is the case with white, grey, buckskin, and bald-faced horses. The feet and muscles of the legs should be carefully looked at, as these are the mainstay of a railroad horse.

A flat-footed horse should never be accepted.

The age should never be less than five or over nine years, as a general rule; a horse of twelve years of age, however, if sound, may be accepted at a considerable reduction in price.

After the horse is selected and placed in the stable, the first thing to do is to accustom him to the feed, and break him to the labor. We would never think of putting on a conductor or driver without first instructing him in the duty expected of him, and place him under the direction of an old hand for practice. This rule should be followed with the horse. The first day he should be allowed to rest. After that if he takes his feed well, he may be put to half-work with a careful driver, and should be worked no more than this for the first six or eight weeks, at least. All green horses should be given in charge of the best drivers, who will take pains to break them in to the work.

The care of the horse in the stable, includes feeding and grooming. Upon the question of feed, perhaps, the first cost or what is termed "economy" has considerable to do.

It is generally admitted that cut hay and corn meal is the cheapest at first cost, of any feed in use; but experience has shown that this feed is too hearty and fattening, and that horses fed upon it for several years without change become more subject to eruptive diseases and also to colic, inflammation of the stomach and indigestion. It is calculated that at least five cents per day can be saved in this feed on each horse, over the cost of feeding oats and long hay, and that the extra loss on horses fed with meal only, will not amount to the sum saved at the end of the five or six years' service of a railway-horse. To the credit of railway managers it is found that this conclusion is not accepted generally; and that while some are found to strictly adhere to what is termed the natural feed of the horse—oats and long hay—very many compromise the question by giving one such feed daily, or, at least, lighten up the corn meal by mixing bran or wheat middlings, in proportion of about half and half by measure. The mixing or preparing of the feed should be entrusted to as *few* persons as possible; but the practice of each hostler dealing out the feed to the horses allotted to him is not objectionable although many stable experts prefer to confine the hostler's duty simply to watering and grooming the horse and the care of his stall, and to provide one man to distribute the feed to each 100 or 125 horses. In general terms, it should be the care of the stable-master to make the horses under his charge as comfortable as possible, while keeping them in condition to do the work required of them. They should be watered frequently and fed regularly, not less than three feeds a day, and thoroughly groomed not less than twice a day. In warm weather, they should be carefully cooled off after coming in from work, and in cold weather well-blanketed. Disinfectants should be freely used; common lime, either dry or in the form of whitewash, is recommended as effective and inexpensive.

As shoeing is a matter of considerable importance to railway managers it is proper that all entrusted with the care of street-railway horses should inform themselves as to the best form of shoe, and the best manner of setting it. There is but little difference of opinion among the well-informed upon this subject, as to the desirability of a light shoe over a heavy one, and that for horses traveling over a paved street, a shoe made of soft iron is preferable to one made of steel, on account of its being less liable to slip. In all cases the shoe should be fitted to the foot and not the foot to the shoe. On the question of hot or cold fitting, W. H. H. Murray may be quoted. He says: "The weight of authority is nearly the same in either scale. The advocates of cold-fitting declare that they can fit a shoe with rasp and file as evenly as the necessities of the case require, and that this can be done at no great cost of time or skill. They, moreover, charge that both reason and analogy are in opposition to burning a horny surface and declare that it honeycombs the wall of the foot, and prevents its natural and healthy growth.

"The disciples of hot-fitting on the other hand, declare that few men can level the foot, or so hammer and file the shoe, that the fit shall be what is required, and that only by burning can the connection between steel and horn be made sufficiently close and solid."

It must be admitted that good arguments can be used on both sides of this question, but in the end both sides bring up with this fact, that whether by hot or cold-fitting the shoe must be fitted evenly and solidly to the foot. As a matter of interest in this connection, an estimate made by a French professor concerning the muscular fatigue resulting from the use of heavy shoes may be quoted:

"If at the termination of a day's work, we calculate the weight represented by the mass of heavy shoes that a horse is condemned to carry at each step, we arrive at a formidable array of figures, and in this way are able to estimate the amount of force uselessly expended by the animal in raising the shoes that surcharge his feet. The calculation I have made possesses an eloquence that dispenses with very long commentaries.

"Suppose the weight of a shoe is 1,000 grams (about 2 1-5 lbs. avoirdupois). It is not excessive to admit that a horse trots at the rate of one step every second, or sixty steps a minute. In a minute then, the limb of a horse, whose foot carries one kilogram (2 1-5 lbs.) makes an effort necessary to raise kilogram after kilogram, a weight of sixty kilograms (132 lbs.) For the four limbs, this weight in a minute is represented by $60 \times 4 = 240$ kilograms (528 lbs.) For the four feet during an hour, the weight is 14,000 kilograms (30,800 lbs.) and for four hours, the mean duration of a day's work in these omnibuses, the total amount of weight raised has reached the respectable figure of 57,000 kilograms (125,400 lbs.)

"But the movement communicated to these 57,000 kilograms represents an expenditure of power employed by the motor, without any useful result, and as the motor is a living one, this expense of strength represents an exhaustion, or if you like it better, a degree of fatigue proportioned to the effort necessary for its manifestation. This calculation is most simple and readily understood. It is to be noted, nevertheless, that I have omitted a considerable factor, which is, that the weights I have tabulated are situated at the extremities of the limbs and that the arms of the levers on which the muscles act to raise them being infinitely shorter than those of the physiological resistance to which these weights are added, the intensity of their action ought, therefore, to be singularly increased.

"But to measure this intensity of action would require a mathematical aptitude, which I do not possess. I will not, therefore, dwell upon this point, notwithstanding its importance, and am content to signalize it. Otherwise the figures speak for themselves, and tell us that the diminution in the weight of horse-shoes is not an unnecessary consideration, so far as the useful application of the horse's strength goes."

After a careful consideration of the above calculation, must not all admit that the lightest possible shoe consistent with the service, should be used upon street-railway horses?

The question of calking the shoe must be settled by the condition of the street over which the animal travels. Many believe that a calk is not necessary on paved streets, except in the winter season, when ice and snow are liable to interfere; and that if a calk is used at all it should be a low one, so as to raise the frog but slightly from contact with the street, and that care should be taken to have all calks of an even height, to allow the horse to set his foot squarely and evenly upon the ground.

Upon the question of nailing the shoe, a quotation from Fleming seems to "hit the nail on the head." "The shoe ought to be attached by nails to those parts of the wall where the horn is strongest and toughest. In the fore-foot, these parts are in front and along the sides to the quarters. There the horn becomes narrow and thin, and the nails find less support, and are nearer to the living textures. This is more particularly the case towards the heels, especially the inner one.

"In the hind-foot the wall is generally strong toward the quarters and heel. These facts at once give us an indication as to the best position for the nail-holes. In the fore-foot, nails may be driven through the wall around the toe, as far as the inside quarter and a little nearer the heel on the outside. In the hind-foot they may be driven around the toe and even up to the heels with impunity."

Nails should be turned out as quickly as possible, as the higher they go the less thickness of hoof is found, and extreme care should be used not to prick or press the sensitive part of the foot. Too many horses are made almost worthless from the effect of "blind stabs," which means, driving the nail into the quick and then withdrawing it, and driving it again so close to the wound as to irritate it and cause it to suppurate within the foot and work out at the top. Such cases are the result of careless nailing, and frequently terminate in what is called "foot-rot." The difficulty in tracing the exact cause of such trouble, arises from the fact that the horse does not show lameness for one or two days.

As the feet of horses working only on paved streets and standing continuously upon wooden floors are liable to become hard and dry for lack of sufficient moisture, it is necessary that the stable-master should adopt some measure of supplying this need. A simple way and one that can be followed in any stable is to furnish each hostler with a pail and sponge, and require him to wet the fore-feet of all his horses, once or twice a day. The water should be applied particularly to the part where the hair and horn meet, and to the heel and frog. A good idea is to dissolve about a half pint of clean salt in each pailful of water used. This plan should be continued daily, and not occasionally. The stable-master should inspect his horses daily, as to their fitness for work, and "lay off," and nurse any that do not "take their feed," or show lameness.

The next care that the horse requires at the hands of railway managers is that of furnishing suitable *drivers*. The best stabling, grooming, feeding and shoeing cannot counteract the effects of bad driving. Those men whose duty it is to select and educate the drivers on street-cars, should be most faithful and efficient, and no man should be retained as a driver who has not the necessary patience and judgment. Many horses become vicious and balky, by ignorant and careless driving, and a quick-tempered driver is liable to be a costly one.

The last care that comes to us in the treatment of the street-car horses is to select or sort out and dispose of those that have become unfit for the service.

This demands good judgment, for the difference between the price obtained for a worn-out horse and a new one to take the place, is considerable, yet it is folly, and worse than bad judgment, to retain and feed horses unable to work, for it does not take them long to "eat their heads off," as the saying goes. All horses should be disposed of as soon as it appears that their capacity for full railroad service is gone.

This report is submitted with the hope that some hint it may contain, will be useful to the members of this association. This subject is an important one, and to be treated fully, would require more space than the limits of this paper will allow, and demand more talent than this committee lays claim to.

As a conclusion to this report, the personal experiences of two members of this committee, Mr. John E. Brown, Sup't. of the Troy and Lansingburg Railroad, Troy, N. Y., and Mr. T. H. H. Robilland, Sup't of the Montreal City Passenger Railway, Montreal, Canada, are added. Both these gentlemen have had large experience in the care and management of horses, and their views cannot fail to interest this convention.

For the Committee,

J. E. RUGG, *Chairman.*

REPORT OF COMMITTEE ON ELECTRICITY AS A MOTIVE POWER.

The Committee on Electricity as a Motor for Railroad Transportation is not prepared to make a report from personal inspection; but from the information received from different sources, they feel justified in reporting the possibilities of the new system to be very flattering. The experiments made in different places demonstrate beyond question its safety and practicability; and it will not be long before the question of economy will be fully determined by the experiments at Cleveland. In this country and in Europe, there are now several electric railroads in successful operation. The Litchterfelde road, in Berlin, has been for four years a financial success, and the results of the experiments at Coney Island, Menlo Park, and by Messrs. Daft and Edison, at the Mechanics' Fair building at Boston, Mass., have thus far been very satisfactory and encouraging. I herewith submit for your consideration the enclosed communication of Mr. W. H. Knight, of the Brush Electric Company, of Cleveland, Ohio, giving the result of the Cleveland experiment in detail. This letter, coming as it does, direct from the operator of the street-railroad at Cleveland, in response to a request from this committee soliciting such information as would be valuable and interesting to the convention, is really the sum and substance of this report, and contains all the reliable information before this committee.

As chairman of the committee I confess that I have not given to the investigation of this question as much of my attention as its importance demanded; but the unusual pressure of official duties during the last six months has occupied all my time.

ED. C. PETERS, *Chairman.*

BRUSH ELECTRIC COMPANY, CLEVELAND, O., Oct. 8, 1884.

E. C. PETERS, ESQ., *Chairman Committee on Electricity as a Motive Power of the American Street-Railway Association.*

DEAR SIR—Your favor of the 30th ult. is at hand, and contents noted.

The electric railway which we are now operating here is about one mile in length, and at present only one car is run on it. The second car will soon be completed, and the line will then be extended across the railway-tracks to a distance of about one and a half miles. This section, with its two cars, will be operated all Winter without intermission, to demonstrate the "rough and ready" character of the motor, after which the system will be extended over the twenty miles of tramway owned by the East Cleveland company.

Last winter we operated a trial railway, built in the yard of these works; and as it stood the tests of all kinds of weather, we have no doubt in our own minds as to its efficiency the year round.

Briefly the system may be described as follows:

Midway between the rails a conduit eight inches deep is laid flush with the pavement, in the manner of a cable road. Two iron rails serving as conductors are supported within this conduit, and through a slot five-eighths of an inch wide in the top of the conduit, a plow depends from the car, and by means of two brushes makes contact with the conductors. Through this plow the current is conveyed to the motor, which is situated between the wheels under the car, and is tightly boxed up to prevent access of dust, etc. The motor weighs half a ton, and the car is an ordinary two-horse box-car, weighing, exclusive of motor, two tons The motor is geared to the axles of the car by friction gear and link-belts. The movement is controlled by levers at either end of the car, these levers operating the commutator brushes on the motor to start, stop, or reverse the motor, or to make it go at any speed desired. It has been run at a speed of fifteen miles an hour.

The dynamo supplying the current is located about a mile from the line and is run by the engine used by the company for grinding corn. It is connected to the conductors in the conduit by an over-head line of No. 8 wire. In practice, no over-head line will be used, and a greater economy may be anticipated. The power is sufficient to run two cars, as the engine and dynamo after being started in the morning, runs all day without attention. Only one man is employed to do the firing, and the expense of power, including fireman, coal and oil is about four dollars per day.

With a larger plant, larger and more economical engines, boilers and dynamos would be used, and a much greater econony obtained.

The conduit will cost from five to seven thousand dollars a mile when made of steel, and it ought to last a lifetime. To equip an ordinary two-horse car will cost in the neighborhood of $1,500, and the power at the central station for each such car will be in the neighborhood of $1,200. Each car will pull another car of the same size.

The steepest grade we have experimented with is 500 feet to the mile, and no difficulty was found in overcoming it.

The conduit is kept free from dirt, snow, etc., by a brush depending from the car through the slot. Catch-basins are placed at intervals varying from 50 to 100 feet, and where possible a sewer connection is made.

The system is similar to a cable road in that it requires a conduit and a central power station; but it differs in every other respect.

It may be operated on single-tracks as well as on double-tracks; and branches may run out from the main road in every conceivable manner. Any speed may be assumed at the will of the operator without wear of machinery. Ordinary car-drivers can operate it after five minutes' instruction. Stoppages can be made quickly by reversing the motor. Running off the track does not injure the machinery, and a flexible connection on every car enables the motor to run the car back on to the track when the lever is reversed. A much smaller conduit can be used than with cables, and there is no machinery along the line. The conductors cost but $200 a mile, and the wear of the brushes upon them seems to be *nil.*

We use a high tension current because our investigations have showed us that when distances greater than one or two miles are to be overcome, no other current will give the necessary economy. The conductors are, however, inaccessible, and no danger is anticipated. We are ready to equip any road not exceeding twenty-five miles in length.

Hoping I have touched upon the main points of interest,

I am, very truly yours,

W. H. KNIGHT.

REPORT OF COMMITTEE ON THE CABLE SYSTEM AS A MOTIVE POWER.

THE AMERICAN STREET-RAILWAY ASSOCIATION:—

Gentlemen—So completely has the country been flooded with literature pertaining to "The Cable System of Motive Power," that the writer of this report has no hope of offering any new facts; but since the system has

acquired such magnitude and prospects, it may be fitting that the archives of the association should possess some brief record of its beginning and progress.

Climbing the steep hills of San Francisco, the fertile genius of Mr. A. S. Hallidie conceived the idea that transportation, which could not be accomplished by animal power, might be by endless ropes; and to him and his associates, all credit is due for the first successful construction and operation of the system, eleven years ago.

What seems so easy and natural in the retrospect, lay before those men an untried, and, in the opinion of many, a foolhardy undertaking. The money invested was regarded as squandered, and the whole scheme a trifling with the impossible. But through innumerable difficulties and trials, they persevered, until intelligent experiment and dauntless courage wrought success. Clay Street Hill became world renowned for its novel and ingenious railway, the advantages of which soon caused parallel lines on steep grades to be constructed on Sutter Street, California Street, Geary Street, Union Street, and recently one on the more level line of Market Street and its branches.

After the first four lines had been built, covering short distances and carrying few people, a road was constructed in Chicago in 1881. The latter city claims not one iota of credit for the invention of the cable system, but did undertake the somewhat serious task of demonstrating

First: That the system could be utilized in a region of harsh Winters, deep snow and frost, the antipodes of the balmy climate and perpetual Summer of California, and,

Second: That it could be expanded into a suitable system for moving the vast population of our largest cities.

The former could not be accomplished by any fragile construction but required great strength and compactness to resist the strains inevitable in a large commercial city, and the powerful pressure of the frost in a Northern Winter. The latter could not be accomplished by any mile, or mile and a half, of timid trying; but with unshaken faith in its method of construction and the possibilities of the system, twenty miles of track were constructed, and the daily transportation of 100,000 people attained, with the ability to move five times as many.

In addition to the lines indicated above, cars have been moved by cable for fifteen months over the New York and Brooklyn Bridge; an extensive system is building in Philadelphia; a line in New York, one in Kansas City, and one in Hoboken, and comprehensive systems have been proposed for New York and Brooklyn. Recently under the superintendence of American engineers this purely American system has been introduced and short lines constructed in London, Eng., South Wales and New Zealand.

The construction consists of an underground tube through which the cable passes (supported by grooved pulleys,) in constant motion and at uniform rate of speed. The tube is provided with sewer connections for drainage, and an open slot on the top, through which passes a gripping device which is attached to a car. The cable is kept in motion, and its speed regulated by a stationary engine or engines. The rope is endless and the splices must possess great strength, but not increase the diameter of the rope, as any enlargement would incur severe and dangerous abrasion. It should be coated with pine tar and lubricated with linseed oil to protect it from rust and the too harsh action of the grips. The drums which impart motion to the cable, and the sheaves which carry it around sharp corners, should have a diameter about one hundred times the diameter of the rope. Of what material the rope should be made to secure the best returns is a question of great importance, affected by climate, the rate of speed it is to run, the frequency of stopping and starting, the character of the gripping device, and the manner of applying the same, and the hilly or level character of the road. In cases of sharp deflections from a level, pulleys are required to depress the rope, and as these must be small to allow the grip to pass below them, the wear upon the cable is serious. To meet these conditions, flexibility and toughness, combined with strength and freedom from crystalization are needed.

Another important feature in a cable system is the device for automatically securing the proper tension of the rope. The extent of vibration will depend on its length, amounting in one four miles long, to some five feet, and is caused by the sudden grappling of the cable by a heavily loaded train. As the rope settles some two and a half inches between every two carrying pulleys over the entire road, the sudden tightening and stretching of the cable produces an accumulation. If this were not instantly taken care of, the rope would drop from the carrying pulleys and sheaves and be destroyed; also violent surgings of the trains would ensue. Were the rope to be drawn so rigidly as to prevent this settling, the intense strain would soon destroy the cable and the operating machinery. Provision is also made in this device for taking care of the permanent stretch of the cable amounting sometimes to two hundred feet.

The gripping attachment should be prompt and positive in its action, and, in the most successful forms yet devised, consists of an upper and lower jaw, between which, the cable is seized by the movement of a lever, one pound of pressure on the handle of which produces four hundred pounds pressure on the cable. A small sheave is placed at each end of the jaw, upon which the cable rides while the car is standing. Provision is also made for throwing the cable out of the grip and entirely free from it at any time or place. Exigencies may arise when this is of the utmost importance. The length of the grip is such that it passes some three inches above the carrying pulleys and does not come in contact with them. The cable is brought into the open jaws by an elevating sheave placed at an angle on one side of the tube. The metal used for lining the grip performs 2,000 miles of service, when it requires renewal.

In Chicago a speed of eight and a half miles an hour is attained over one half the lines, and nine and one-half miles over the other half; except in a few places where the speed is one half the above rates and can be made as much less at any point as may be desired. To operate at this speed with safety, the cars are provided with ample guards which prevent any one from falling under the wheels, and powerful brakes can be applied to every wheel in the entire train by the easy movement of a lever in the hands of the driver.

The system possesses special advantages in heavy snow-storms, as the power is not derived from friction on the rail, but the appliances for clearing and sweeping the track are drawn swiftly and at short intervals by an untiring power. More power is required during a snow-storm, but in ordinary conditions, the operation of twenty and one-fourth miles of cable in Chicago has required 477 horse-power; of this 389 was used in moving machinery and cables, and 88 to move the 240 cars and their passengers. The cable and its coating weighs about 270,000 pounds, and is doing work which would require 2,500 horses.

In hilly sections where horses and locomotives would be useless for the purpose, the cable system can move cars as quickly and swiftly as on a level road; and on level roads it is found to be only one-half as expensive in operation as the ordinary horse-railway system, while its capacity for moving vast numbers of people is practically unlimited. It is the only system yet devised, which satisfactorily meets the uneven pressure for transportation with the least possible increase in expense. No difficulty is experienced in turning corners, either with main cables or auxiliaries.

As regards humanity for horses and consideration for the nerves of passengers, it commends itself to all. In point of cleanliness, a system which saves the use of thousands of animals in a city is of great sanitary value, and the comparative quietness of its operations is highly appreciated by those who reside beside it.

The speed at which it runs, and the quickness and ease with which it starts and stops adds to the comfort and well-being of its patrons; and when equipped with the present safeguards and appliances, is found to be far more safe to the general public than the ordinary horse-car. It has no will of its own to thwart the will and efforts of the faithful driver.

The increase in the value of real estate along the street where it operates, and on parallel and cross streets for several blocks each way, is many times the cost of its construction, being from 50 to 200 per cent. in a single year.

The cost of construction is much greater than that of an ordinary tramway, but the economy of operation far outweighs this objection, as it saves more than the interest on the increased cost.

In Chicago, the cost was perhaps greater than would be necessary in most cities, owing to the nature of the ground, reaching $105,000 per mile of single track. Too much stress cannot, however, be laid upon the importance, *the absolute necessity*, of a substantial and durable structure which will not be broken or displaced by heavy trucks or by the pitiless frost. If all the parts and appliances are well and permanently built with ample safeties in point of strength, and vigilance attends its operation, it will prove a great and unalloyed blessing to any city, and bring satisfaction and recompense to its owners.

The limits of this report will not allow allusion to the manifold improvements made and making in many quarters, in its construction and appliances, but what has been accomplished in so short a time is ample guarantee that vast good is yet to come from "The Cable System as a Motive Power." In behalf of your committee, this report is respectfully submitted.

C. B. HOLMES,
Chairman.

CHICAGO, October 15th, 1884.

REPORT OF COMMITTEE ON A UNIFORM SYSTEM OF ACCOUNTS.

The American Street-Railway Association:

GENTLEMEN—The committee appointed on "A Uniform System of Accounts," is of the opinion that what is wanted is "A Uniform System of *Operating Expense* Accounts," rather than a Uniform System of General Accounts of Assets and Liabilities.

A circular was issued by the chairman of this committee to the several street-railroad companies belonging to this association, asking for a list of accounts kept by their respective companies. The chairman wishes to report that the responses were promptly received from nearly every company in the association, showing that a great and general interest is felt in this matter. The information is gathered that there is a great diversity in the methods of keeping accounts, and it is certainly very evident that a uniform system of keeping operating expense accounts would result in very great good, not only for the opportunity it would afford for comparisons, but it

might possibly furnish information which would result in savings to many companies.

Your committee takes pleasure in presenting the system now in use by the Louisville City Railway Company, and of recommending and offering the same for your consideration and discussion.

The operating expense accounts kept by that company are as follows:

No. 1. Conducting transportation.

No. 2. Motive power.

No. 3. Maintenance of way.

No. 4. Maintenance of cars.

No. 5. General expense.

Under these general headings are kept several sub-accounts, as shown in the accompanying form kindly furnished by the Louisville City Railway Company, and which is herewith presented by your committee as part of this report. The form may be modified to suit the different companies.

Respectfully,

E. K. STEWART, *Chairman.*

Sub-Divisions of Operating Expense Accounts, and of Construction, Equipment and Improvement Accounts.

1. CONDUCTING TRANSPORTATION.

1. Supervisors, Inspectors and Starters—Labor: Starting cars, supervising the running of cars, and overseeing and keeping time of conductors and drivers.

2. Receivers and Clerks—Labor: Receiving and reporting fares paid to conductors, putting up and selling change, and handling fare boxes.

3. Conductors—Labor: Conductors' wages.

4. Conductors' Extra Pay—Conditional percentage on conductors' earnings.

5. Switchmen, Flagmen, etc —Labor: Switching, flagging and pushing, curve men, turntable men, gatekeepers, and driver of advertising car.

6. Car and Lamp-cleaners and Watchmen—Labor: Lampman, car and lamp-cleaners, and watchmen at car houses.

7. Lighting, Oiling and Cleaning Cars—Oil, matches, etc., for lighting; oil, brooms, brushes, rags, sponge, etc., for oiling and cleaning, and straw used in cars.

8. Stationery, etc.—Envelopes, slips, cards, notices, bill-boards, paste, school tickets, and employes' passes.

9. Registers and Punches—Expense incident to use of same.

10. Furniture and Implements—In car-houses and receiver's and starter's offices, including money satchels, boxes and carts, and repairs of same.

11. Car License—Payable to City.

12. Loss from Accidents—Legal, medical and other expense growing out of injuries to persons and property.

13. Fuel, Light and Water—Used in car-houses and receiver's and starter's offices.

14. Car-Houses and Office Repairs—Labor: Repairing, whitewashing, and cleaning car-houses and receiver's and starter's offices.

15. Car-House and Office Repairs—Materials, etc. used, and other expense of same not charged in No. 14.

2. MOTIVE POWER.

16. Animals—Cost of animals, and expense incident to purchasing same.

17. Care of Animals—Salt, medicines, etc., and other expense not charged in Nos. 16 and 18.

18. Stable Men—Labor: Foremen, hostlers, surgeon and watchmen.

19. Forage—Cost of same, including freight.

20. Handling Forage—Labor: Hauling, weighing, storing, cutting, grinding, and otherwise handling and preparing food.

21. Stable Tools, Implements and Machinery—Groomers, extinguishers, and all stable tools and machines, and repairs of same, not charged in No. 24.

22. Feed-mill, Implements and Machinery—Machinery and implements used in handling food, wagon license, inspecting scales, and all repairs not charged in No. 24.

23. Blacksmiths' Tools—Including material used, and other expense of making and repairing not charged in No. 24.

24. Shoeing Animals, etc.—Labor: Shoeing animals and repairing machinery, tools, etc., in stables and harness and smith-shops.

25. Shoes and Nails—Including material used, and freight on shoes, nails and material.

26. Harness and Repairs—Labor: Making and repairing harness.

27. Harness and Repairs—Material and tools used in harness-shop, and other expense of making and repairing not charged in No. 24.

28. Furniture and Repairs—Elevator, stoves, clocks, etc., in stables and smith and harness-shops.

29. Fuel, Light and Water—Used in stables and smith-shops, including cost of wells and pumps on premises.

30. Drivers—Labor: Drivers' wages.

31. Drivers' Extra Pay—Conditional percentage on drivers' earnings.

32. Stable and Smith-Shop Repairs—Labor: Repairing, whitewashing and cleaning stables, smith-shops, wells, pumps, fences, and yards adjoining.

33. Stable and Smith-Shop Repairs—Material used and expense incurred, not charged in No. 32.

3. MAINTENANCE OF WAY.

34. Track Repairers—Labor: Supervisor, foremen, teamsters and laborers on track and turntables.

35. Track Repairs—Cost of wood material used, including freight and work done on same, not charged in No. 34.

36. Track Repairs—Cost of iron material used, including freight and work done on same, not charged in No. 34.

37. Track Repairs—Water, rock, gravel and other expense not elsewhere charged.

38. Track Cleaners—Labor: Removing obstructions from track.

39. Cleaning Track—Salt, residuum, oil, etc., used for this purpose, and expense of removing obstructions from track.

40. Road Tools and Implements—Including plows and scrapers, road-wagons and carts, license on same, and repairs not charged in No. 41.

41. Road Tools and Implements—Labor: Making and repairing all tools, implements, vehicles, etc., used on road.

42. Incidental Road Expenses—Any expense incident to maintenance of way not chargeable to other sub-accounts.

4. MAINTENANCE OF CARS.

43. Car Repairers—Labor: Repairing cars.

44. Car Repairs—Cost of material used, and other expense not charged in No. 43.

45. Car Furniture and Repairs—Fare boxes, poles, racks, signs, single and double trees, curtains, lamps, chimneys, etc., and repairs not charged in No. 46.

46. Car Furniture and Repairs—Labor: Making and repairing any of same.

47. Shop Tools and Machinery—Machinery, tools and furniture, used in car and paint-shops, and expense making and repairing not charged in No. 48.

48. Repairing Tools and Machinery—Labor: Making and repairing same.

49. Furniture and Repairs—Used in car and paint-shops.

50. Fuel, Light and Water—Used in car and paint-shops.

51. Repairing Car and Paint-shops—Labor: Repairing, whitewashing, and cleaning shops and premises.

52. Repairing Car and Paint-shops—Material used, and other expense not charged in No. 51.

5. GENERAL EXPENSE.

53. Salaries of General Officers—President, vice-president, directors, secretary, treasurer and superintendent.

54. Expenses of General Officers—Traveling and other expense on company business not chargeable to other sub-accounts.

55. Salaries of Clerks—In offices of superintendent, secretary and treasurer.

56. Office Expenses—Fuel, light, water, ice, postage, telegrams, wages of janitor, etc.

57. Stationery and Printing—Books, maps, blanks, stationery, printing, advertising, and other like expense, not chargeable to No. 8.

58. Telephone Service—Cost of same, and repairs of office telephone.

59. Furniture and Repairs—Safes, counters, desks, chairs, clocks, money-scales, awnings, etc.

60. Office Repairs—Labor: Repairing general offices.

61. Office Repairs—Material used, and other expense not charged in No. 60.

62. Interest, Discount and Exchange—Including expense of paying coupons.

63. Sprinkling—Sprinkling street in vicinity of general offices.

64. Rents—On buildings and ground.

65. Taxes—Payable to City and State.

66. Insurance—Premiums on same.

67. Legal Expenses—Attorneys' and clerks' fees, copies of court records, city ordinances, etc., not chargeable to No. 12.

68. Detective Service—Any expense of this character.

69. Real Estate Expenses—Surveyors' fees and any expense incident to purchase and sale of real estate.

70. Gratuities—Rebates of fares, and donations of every kind.

CONSTRUCTION, EQUIPMENT AND IMPROVEMENT ACCOUNTS.

71. Cars—Labor: Building new cars.

72. Cars—Material used, and other expense of building new cars not charged in No. 71.

73. Track—Labor: Constructing new track.

74. Track—Material used and other expense of constructing new track not charged in No. 73.

75. Buildings and Improvements—Labor: On new buildings, sheds, etc.

76. Buildings and Improvements—Material used, and other expense of new buildings and improvements not charged in No. 75.

Use of Iron Sleepers on Street-Railways.

A RECENT issue of *Le Génie Civil* contains some observations concerning the use of iron sleepers on the street-railways of Paris. The roads were first introduced into France by M. Loubat in the year 1852, but made little progress until 1873, when concessions were obtained for the construction of sixty-four miles (103,500 m.) of lines in Paris. This concession was divided into three systems, which were allotted respectively to the Compagnie Générale des Omnibus, the Compagnie des Tramways-Nord, and the Compagnie des Tramways-Sud. The ordinary grooved tram-rail, spiked to a longitudinal timber sleeper, was first adopted. The weight of rails used at first was thirty-eight pounds per yard, which rails were found to last ten years; but a forty-six pound rail was subsequently introduced, which was estimated to have a life of twenty years. The Compagnie des Omnibus have since and up to the present time used a grooved rail of about the same weight (forty to forty-eight pounds per yard), fastened to a longitudinal sleeper by a countersunk bolt passing through the bottom of the groove. In this system it is found that the holes bored vertically through the sleeper permit the infiltration of water and hasten the decay of the timber and loosening of the bolts. The company are now making trial of a system introduced by M. Massillon, which has been in use some time on the Lille roads, consisting of an ordinary bridge-rail and counter-rail of light section bolted to an iron longitudinal sleeper. This system, from the absence of timber, forms a more durable road, but is much less elastic under the passage of wheels than the older modes of construction. It is found that that the counter-rail should have the same section as the rail, in order that it may stand the wear and tear of the ordinary road traffic.

Danchell's Electric Railway.

THERE is on exhibition at the Westminster Aquarium, says *Engineering*, a working model of a new electric railway for which very considerable advantages are claimed by the inventor, Mr. Danchell. The feature which distinguishes it from previous attempts of the same kind is that the locomotive and vehicles run between a pair of rails placed vertically one over the other, the lower carrying the weight and the upper serving as a guide to prevent the vehicles from falling over sideways, and also, in some instances, increasing the adhesion of the locomotive. Each vehicle has two wheels, one before the other. These wheels are not flanged, but are kept on the track by eight guide rollers, two running against each side of the upper rail and two against each side of the lower rail. The electric motor carries on its spindle a small friction pulley situated between the two driving-wheels of the locomotive. These wheels are carried in sliding bearings and can be set up to obtain a sufficient pressure against the friction pulley, so that the rotation of the motor is imparted to them. For lines with steep gradients, a small wheel is fixed over each driving-wheel in such a way that it has a constant tendency to jam itself between the wheel and the upper rail and thus increase the adhesion of the locomotive. The rails act as the conductors for the current, which enters the motor from one of them and leaves it by the other. It is claimed for this railway that it will run with very small friction, and that exceedingly high speeds are possible without danger, but it is difficult to find any argument for putting an electric locomotive on a single rail which is not equally applicable to a steam locomotive, while the safeguard afforded by an overhead rail is as available with one kind of carriage as another. An engineer who put forward such a plan with any existing form of traction would expose himself to derision, and we fail to see that the use of electricity as a propelling power alters the conditions of stability under which a railway works. As to the electrical part of the scheme it appears devoid of novelty, and whatever advantages exist in the Danchell railway are to be found in the use of a single track and a steadying overhead rail.

Underground Cable Railways.

AN exchange remarks that an important advance in the development of cable roads is to be noted in the approval by the British Parliament of a scheme for constructing an underground railway to be operated by cable in the city of London. This road is to run from a point in King William Street, where it connects with the present underground railway system of that city, to St. George's Church in Southwark, the converging point of the present southern system of tramways terminating at the "Elephant Castle," about 1.25 miles. Each of the two lines will be in a separate tube ten feet in diameter. A space of thirty cubic feet per passenger will be given in the cars, which is ten more than is required by the Board of Trade. The diameter is five feet less than would be required if locomotives were used. The cable will be run at a uniform speed of ten miles per hour and is to be worked by hydraulic power—no steam being used. The cars will hold fifty passengers, and will run every two minutes during the eight busiest hours of the day. The charge for the entire distance is to be one penny, so that the gross receipts for a fully-loaded car will be less than $1. The total estimated cost of the line, including equipment is about $1,175,000 (£235,000), on which an average of half-loaded cars throughout the year would pay ten per cent. annually, exclusive of the estimated cost of maintenance, repairs, etc. The progress of the enterprise will be watched with much interest.

A Railway Run by Water.

AN English exchange describes a railway at Falcon Cliff Castle, Isle of Man, some particulars of which may be interesting. The railway consists of an up and down line of the ordinary four-foot gauge, running parallel for about fifty yards on a gradient of about one in three. The vehicles, two tramway cars, are moved by water poured into an iron tank upon which each car rests; and the running is controlled by a stationary hand brake. The tank is of an angular shape and rests upon four wheels of the usual railway coach pattern, with a single flange on the tire. The shape of the tank necessitates two of the wheels being placed lower than the other two, while the body of the car resting on the horizontal line of the angle, admits of it preserving a perfect level although running on so enormously steep an incline. A cable, permanently affixed at each end to the cars, runs in the center of the four-foot

track and around a wheel about six feet in diameter, stationed at the top of the gradient, the other upon the parallel pair of rails being at the bottom. The tanks upon which the cars are fixed are fed with water at the top of the incline and emptied at the bottom, the weight of the water in the filled tank being sufficient to sink this car to the bottom of the gradient and at the same time by means of the attached cable to draw up the car and passengers resting upon the empty tank. The mechanism for filling the tanks can be worked by the same man who has charge of the brake of the wheels upon which the cable revolves, and by means of which the speed of the running of the cars is controlled.

Street-Railway Earnings.

THE following yearly reports have been filed with the Railroad Commissioners of New York State, to Sept. 30, 1884: The New York and Harlem Railroad—Receipts from passengers, $751,928.95; haulage of cars, $54,600.75; rents, $42,477.17; miscellaneous, $4,533.51; total receipts, $853,540.38. Payments—Transportation expenses and repairs, $544,838.69; interest, $14,098; dividends, $189,000; State tax on capital stock, $4,725; on gross earnings, $3,972.09; total payments, $756,633.78. There were four persons killed during the year and six injured. The Broadway and Seventh Avenue Railroad: From passengers, $888,555.83; from interest, sales of materials, etc., $32,992.24; total receipts, $921,548.07. Payments—Transportation expenses, $638,943.93; interest, $117,956.26; dividends, 8 per cent., $168,000; total payments, $924,900.19. Three persons were killed and five persons injured during the year.

The Future of Electricity.

EDISON, the inventor, indulges in the following prediction: "As to the changes which will be effected by electricity within fifty years in the city of New York, I would say that I believe electricity will propel the cars of the street and elevated railroads, light the city within and without its buildings, furnish power for all purposes, work telephones and burglar alarms, deliver the opera, convey parcels, detect and signal fires, operate fire-engines, and possibly displace animal locomotion for vehicles."

Of Course He Would.

THE last seat in the horse-car had just been taken, when a very pompous, nervous old gentleman boarded it and casting his eye around in search of a place in which to deposit himself, discovered that a little boy occupied the corner seat at the further end. The old gentleman evidently made up his mind to have the corner seat, and, approaching the youngster, he said: "My good little boy, you are younger than I am and can stand the strain upon your legs better than I can, for I have so much more to hold up. Won't you, like a good little boy, give me your seat?" "Naw," said the boy, stoutly gazing at the old gentlemen. "You should be more polite, my boy, and more obliging. You know that if your father should come in now and ask you for your seat you would give it to him." "You betcher life I would," answered the boy in a truly obliging spirit, "'cause I wouldn't ride in no car wid no ghost."—*Exchange.*

Proper Distinctions.

"WILL you pull the bell?" she asked of a man across the aisle as the car reached the corner. "No, madam," he answered with a bow; "but I will be most happy to pull the strap which rings the bell." "Ah! but never mind! The strap is connected with two bells, and you might stop the wrong end of the car!" And the look she turned upon him was full of triumph veneered with cayenne pepper.—*Detroit Free Press.*

Force of Habit.

"HOW old is your little boy?" asked Mr. Smith.

"He is just six."

"No I ain't," interposed the little boy, "I'm eight."

"Why, so you are—of course, what am I thinking about?"

"I guess you must be thinking about the street-car conductor, pa."—*Exchauge.*

STREET-RAILWAY NOTES.

THE elevated railroad companies of New York, in the year ending Sept. 30, 1884, carried 96,702,620 passengers, and the gross receipts of the companies were $6,726,359.30. Since the opening of the original line, the New York Elevated Railroad, on September 30, 1872, to September 30 of this year, the total number of passengers carried by the several lines aggregated 474,465,558, and the aggregate gross receipts were $34,075,637.70. There has been an increase of over 100 per cent. in the number of passengers carried since September 30, 1879, without any extension of the railroad lines.

THE capital stock of the Greenpoint (L. I.) and Lorimer Street Railroad Company, which has filed its articles of incorporation, is placed at $120,000. The proposed road is to run through Broadway to Fifth street, to Division avenue, to Lee avenue, to Gwinnett street, to Broadway, to Lorimer street, to Van Cott avenue, to Manhattan, to Meserole, to Franklin street, to Greenpoint avenue, and thence to the Tenth and Twenty-third street ferries.

THE South Bend (Ind.) and Mishawka Street-Railway Company, which has a capital of $100,000, has filed articles of incorporation. The directors of the company are Edward B. Dikeman, Perley H. Brown, Jeremiah W. Boynton, J. H. Knight and John Lyons.

IN the department of new inventions this month is published the description of a street-railway rail-joint recently patented by a valued contributor to the JOURNAL, Mr. Augustine W. Wright, superintendent of track construction of the North Chicago (Ill.) City Railroad.

THE city of New York has just received from the elevated roads the sum of $1,285,523, the amount of the taxes of the latter, which have been in dispute for many years.

BROCTON and North Easton, Mass., are to be connected with a street-railway six and a half miles long.

TWO new street-railways are reported in Texas; one in Fort Worth and one in Brenham.

A STREET-RAILWAY is about to be constructed in Montgomery, Ala.

New Inventions.

Pettengill's Lock for Railway Switches.

PHILANDER L. PETTENGILL, of Elmira, N. Y., has recently invented an improved lock for railway switches, by means of which the switch-levers are adapted to be locked in their two different positions when the switch is opened or closed.

The accompanying cuts illustrate the device and its operation. Fig. 1 is a side view of the lever of a railway switch provided with the improved lock, showing the lever in full lines in one position and in dotted lines in its

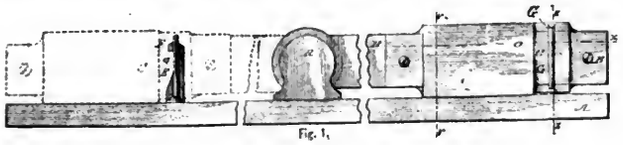


Fig. 1.

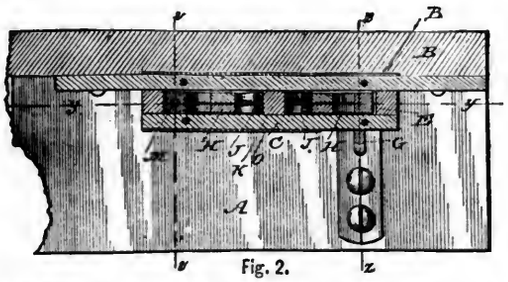


Fig. 2.

PETTENGILL'S LOCK FOR RAILWAY SWITCHES.

other position; Fig. 2 is a horizontal section on line *x x*, in Figs. 1 and 3; Fig. 3 is a vertical section on line *y y*, in Fig. 2, and Fig. 4 is a perspective view of a railway switch in which the lever is provided with the improved lock. The reference-lettering is similar throughout the four cuts.

A indicates the base upon which the lever is pivoted in a bearing, R; and B is the switch-lever which is adapted to be swung to either side, resting with its edges upon the base, and which may be provided with a handle P. Upon one side of the lever, near its outer end, is secured a casing C, having two slots D D, in the upper and lower side piece of the casing—one near the outer end of the same and the other near the inner end—adapted to receive and admit into the casing two lugs E E, secured upon the base, one upon each side of the fulcrum of the lever. These lugs are upright and provided at their upper ends with inwardly-projecting hooks or shoulders F, and two upright guide-lugs G G, are secured upon the base by the sides of the shouldered lugs, adapted to bear against the outer side of the casing when the shouldered lugs or catches E are inserted into the casing. Two shouldered pairs of bolts H H, are pivoted at their ends in the casing, immediately inside the inner ends of the slots, having their free ends sliding in guide-grooves I, in the upper and lower side pieces of the casing, and are adapted to catch under the shoulders of the lugs or catches, and two pairs of springs J J, bear with their free ends against the inner sides of the free ends of the bolts, forcing them outward, having their inner ends secured to the ends of a cross-piece K, in the middle of the lock-casing. The ends of the lock-casing have two transverse slots L L, entering the casing at the free ends of the shouldered bolts, and two pins M M, passing through the upper and lower side pieces of the casing, divide the entrance of these slots. The key has a bifurcated end, the ends entering one upon each side of the dividing-pin in the slots or key-holes, and by pressing the key into the key-hole the bifurcated ends of the same will force the free ends of the pair of pivoted bolts back, releasing the shouldered catch, allowing the lever to be turned. When swung over to the other side of the fulcrum, the lug E upon that side will enter the slot upon the other side of the casing, the guide-lug G guiding the lever, holding the lever in that position until the lock is unlocked by introducing the key into the other key-hole. A casing O, open at its ends, slides upon the lock-casing, the lever being cut slightly away, as shown at B′, to accommodate the same, and is as much shorter than the lock-casing as the distance from the end of the lock-casing to the inner end of the catch-receiving slot D; and it will be seen that when the lock-casing is placed upon the catch the sliding-casing will cover the other catch-receiving slot, preventing dirt or ice or snow from entering

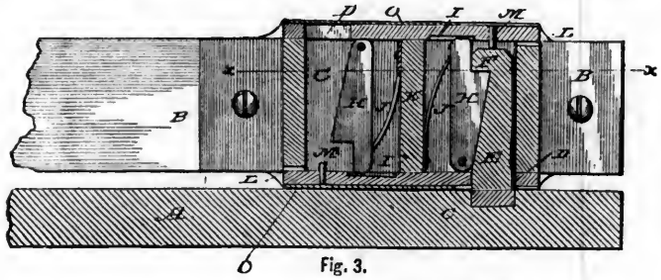


Fig. 3.

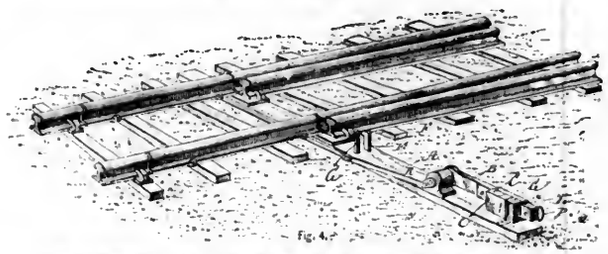


Fig. 4.

PETTENGILL'S LOCK FOR RAILWAY SWITCHES.

into the casing. It will also be seen that by having the pivoted bolts in pairs and by dividing the entrance-slots or key-holes by means of the dividing-pins, the bolts can only be operated by a bifurcated key of the exact proportions, rendering it impossible for persons not concerned to tamper with the lock and switch.

For practical use on railways the double lock can be dispensed with, and only the half used to lock the lever in position for the main line, leaving the other half of the lock-casing vacant, to shut down over a projection when turned for the side track, and to be fastened with hook or pin as is customary in place of locking; but when the lever is turned for the main line it will, being automatic in its action, become locked when the lever is placed in its proper position. In leaving out one-half of the lock the sliding cover becomes entirely unnecessary, as there would be no opening for ice or snow to enter. The single lock can be used on all doors that open and close with sliding or roller movement, such as car-doors, etc., becoming, when in practical use, a cheap and effective lock.

Delffs' Railway-tie.

ARNOLD N. D. DELFFS, of Bedford, Tenn., has recently invented a railway-tie, in which beton, wood and iron are used in the construction. The accompanying cuts illustrate the tie, the reference-lettering being similar through-

out. Fig. 1 is a longitudinal section of the tie; Fig. 2, a cross-section of Fig. 1 on the line *x x*; Fig. 3 a perspective view of the bed-piece, and Fig. 4, a perspective view of a wooden piece to be attached to the bed.

In the construction of the tie the bed-piece A, is made of beton concrete, formed in the usual manner from gravel or broken stone, cement, and sand. These bed-pieces, when molded, will have one or more iron rods or wires B, embedded in the material, extending through the whole length of the tie to strengthen it. In each end of the bed is a mortise C, having in the inner end a recess D, to receive a wooden piece E, extending above the bed, to which

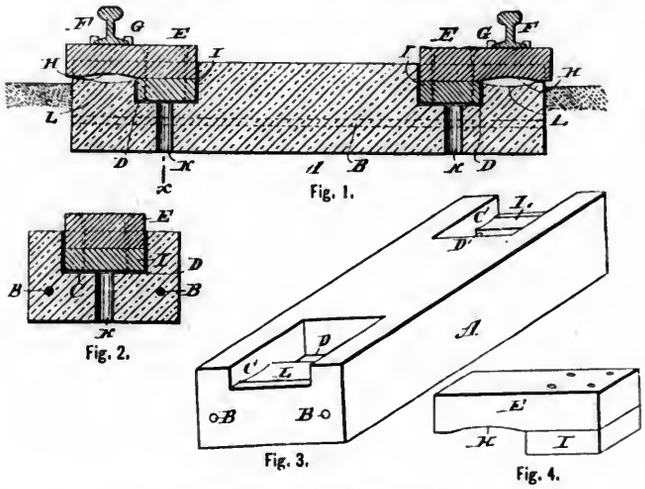


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

DELFF'S RAILWAY-TIE.

the rail F will be secured by the spikes G. The bottom of the mortise, outside of the recess D, has a downward curve L, extending across it, and the piece E has in the end fitted to lie over this curve a corresponding upward curve H. The end pieces E, of the tie are made of wood, to give to the tie a measure of elasticity, and the curves G and H provide for an increase of elasticity as the rail F is secured to this wood piece directly over these curves. The part I of the piece E, resting in the recess D, holds the pieces in place and prevents the rails from spreading. In the bottom of the recess D is a hole K, through the bed A, to allow any water that might get in the recess to escape.

The curve H, in the end of the bed-piece, may be dispensed with, as sufficient elasticity may be secured without it; but it will usually be preferable with it. In this way, by combining concrete, iron, and wood, a tie is made at a moderate cost, and well adapted to the purpose.

In building a new road the wooden blocks comprising the parts E and I may be made in one piece, while in repairing, the piece I has to be separate and first placed in the recess D. The piece E is then put in place and secured to it.

Dwight's Improved Car-brake.

EDMUND W. DWIGHT, of Philadelphia, Pa., is the inventor and patentee of an improved car-brake, which is herewith illustrated and described. The invention consists of a car-brake having its shoes connected in such a manner that they are forced against the opposite sides of a car-wheel, and operate effectively.

Figure 1 represents a side elevation, partly sectional, of a car-brake embodying the invention, and Fig. 2 a top or plan view thereof. The reference-lettering is similar in both cuts.

A A′ represent brake-shoes on opposite sides of a car-wheel, and B B′ the hangers thereof. From the hangers B depend the sliding beams C, through which are freely passed the rods D, one end of each of which carries a brake-shoe A, while the other end is pivoted to an arm E, whose lower end is pivoted to links F, which are also pivoted to the beam C.

To the upper end of the arm E are pivoted the longitudinally-extending rods or arms G, which extend to the other brake-shoe A′, and are pivoted thereto, it being seen that by means of the mechanism described a pair of brake-shoes A A′ is connected and work conjointly, the operation being as follows: The beams C are connected with the brake-lever H and receive power therefrom in any suitable manner, whereby sliding motions are imparted to the beams in the direction toward the car-wheels, the beams riding freely on the rods D. The links F follow the motions of the beams C, and thus draw the lower ends of the arms E with them. This moves the rods D inwardly, whereby the shoes A are forced against

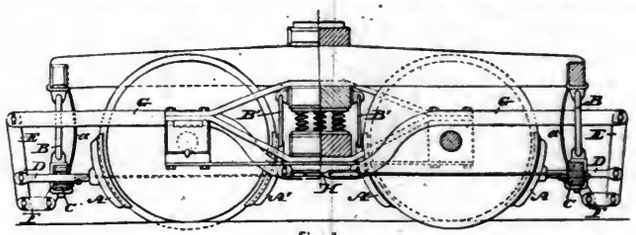


Fig. 1.

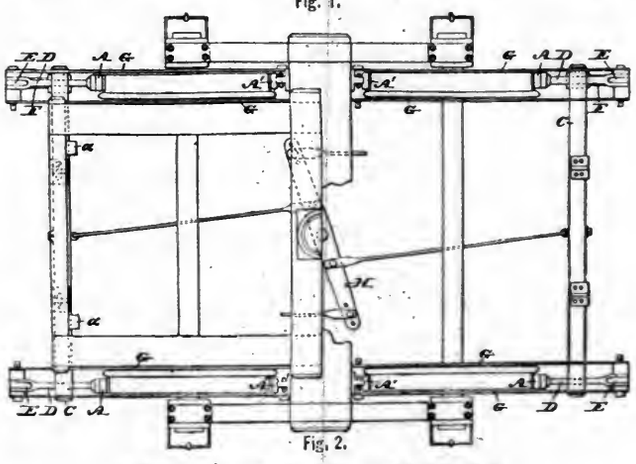


Fig. 2.

DWIGHT'S IMPROVED CAR-BRAKE.

the wheels, and also moves the upper end of the arm E outwardly, whereby the rods or arms G are also drawn outwardly, the effect of which is to draw the shoes A′ against the wheels, and thus both shoes are powerfully forced against the wheels on opposite sides of the same, and an effective brake is produced. When the lever H is released, the parts are permitted to resume their normal positions and the shoes are relieved, the return motion of the beams C being assisted by suitably-applied springs *a*.

Wright's Railway Rail-joint.

THE accompanying diagrams illustrate a new and improved railway rail-joint devised and patented by Augustine W. Wright, Superintendent of Track Construction of the North Chicago (Ill.) City Railway, and designed especially for use on street-railways. In the construction

of street-railways as at present commonly practiced, it is customary to lay the rails upon stringers, and to connect the abutting ends of the rails by means of chairs or splice-plates upon which the rail ends rest, and to which they are connected by spikes passing through the rails and chairs and embedded in the stringers. An objectionable feature of this construction is that the weight of the cars and traffic upon the rails has the effect, after a time, of loosening the spikes and packing down the fibers of the wooden stringers, and hence depressing their upper surface, so that the joint between the rails and the chairs becomes insecure, allowing the ends of the rails to lie unevenly and be pounded by the car-wheels and speedily worn out.

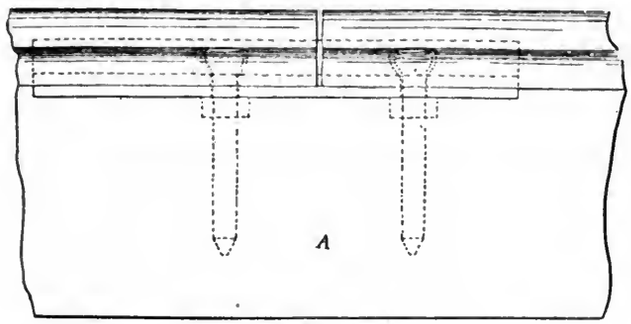


Fig. 1.

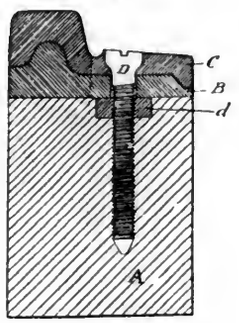


Fig. 2.

WRIGHT'S RAILWAY RAIL-JOINT.

The present invention has for its object to provide an improved joint for railway-rails by means of which the abutting ends of the rails shall be firmly held to the chairs and to the stringers in such manner that, notwithstanding any slight depression in the surface of the stringers, or loosening of the bolts after long and severe usage when the wood has begun to soften, the joint between the chair and the rail ends will remain firm, and the surface of the rail ends will be always in the same horizontal plane, and hence not subject to excessive wear. The invention consists in combining or joining the rails, the chairs or tie-plates, and the stringers or other suitable supports by means of bolts which pass through slots or perforations in the rails and chairs, and are suitably connected to the stringers, such bolts being provided with nuts which firmly clamp and hold the rails and chairs together, regardless of any possible loosening of the bolts in the wood or irregularities of the stringers.

The accompanying cuts illustrate the device and its methods for obtaining the desired ends. Fig. 1 is a view in side elevation, and Fig. 2 a view in vertical transverse section.

A designates a stringer upon which rests the chair B, that supports the abutting ends of the rails C. These rails and chairs are provided with suitable perforations (elongated slightly to allow for expansion and contraction) through which pass the bolts D, that carry the nuts *d*. These nuts *d*, fitting as they do over the threaded portion of the bolts, serve to clamp the rail ends and the chair firmly together, and as they rest within seats in the upper surface of the stringer, and are preferably somewhat oblong, they are thus securely locked against accidental loosening. The threaded portions of the bolts D enter the stringer and hold the chair and rails securely in place thereon. Although bolts are shown, with threaded portions for entering the stringer, they may be attached thereto in other suitable manner.

In laying the rails, seats are cut in the stringers for the chairs, but to such depth only that the chairs will hold the portions of the rails immediately beyond them a very slight distance above the surface of the stringers, as it will happen that after some use the chairs will sink into the stringers a sufficient distance to permit the rails to rest thereon. It will be noticed that the ends of the rails are not above the central point of the chair, but that the larger part of the chair is beneath the further rail with reference to the direction of travel. This arrangement is made for the reason that the strain upon the end of that rail is greater than upon the other, and hence a broader support is desirable.

The Robinson Car-coupler.

WILLIAM ROBINSON, of Bellefontaine, Ohio, is the inventor of an improved automatic safety car-coupler, which is herewith illustrated and described. The object of the invention is to provide an automatic car-coupler which can be operated either from the top or the side of the car, and in which the pin can be set in a raised position and then locked in place, so that the cars cannot possibly couple until it is desired that they shall.

In the accompanying cuts, Fig. 1 represents a front view of the end of a car with the invention applied, showing the device for operating the coupler from the side or top of the car. Fig. 2 is a transverse sectional view showing the draw-head with the coupling-pin raised to await the entrance of the link in the slot of the draw-head, and Fig. 3 a transverse sectional view showing the pin in the position it assumes after the entrance of the link. The reference-lettering is similar throughout.

A represents the draw-head, of any suitable construction, upon the top of which is formed the rib or flange B. Through the top of the draw-head is formed a suitable opening for the pin C to play freely through, and in the front end of the flange B, is made a curved groove which serves as a guide to keep the pin straight in its movement. Pivoted in the front end of this rib or flange, and projecting down into the head, is the trigger D, which has a notch F, made in its upper end, for the projection G on the rear edge of the pin, to catch in. When the pin is raised to its full extent, as shown in Fig. 2, the projection G catches in the recess in the upper end of the trigger, and the pin is supported in this elevated position ready either to couple when the cars run together, or to be held in this position so that the cars cannot be coupled unless it is desired to do so. While the pin is held in this raised position, the lower end of the trigger is forced forward,

ready to be struck by the incoming link of another car, and when struck, unless the pin is locked in its raised position, the pin is tripped and drops at once, as shown in Fig. 3. In the head A, just in the rear of the hole through its bottom for the pin to pass through, there is made a depression H, in which the inner end of the coupling-link can be forced downward, so as to hold it in a slightly

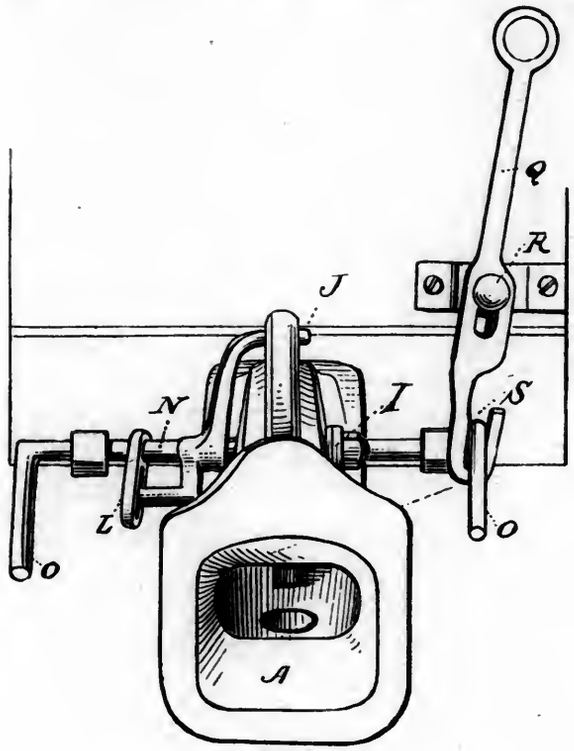


Fig. 1.

THE ROBINSON CAR-COUPLER.

raised position ready for coupling. The projection G, on the pin serves to catch over the inner end of the link and to hold it in position.

Passed through the flange B is the rod or bolt I, which serves as a pivot upon which the bent rod or crank J turns, as shown in Fig. 1. The upper end of this rod or crank is turned upward over the top of the head and passes through the upper end of the coupling-pin. The lower end of the road or crank projects a suitable distance below the bolt I, and is turned outward, so as to catch in the slot in the arm or lever L, which projects downward from the partially-rotating and endwise-moving rod N. When the rod N—which extends across the end of the car and is provided with a handle O at each end—is partially turned, the arm or lever L is moved so as to operate the crank and either raise or depress the pin, as may be desired. The crank being connected to the pin, and to the crank connected to the arm L of the rod N, the pin can only be moved in connection with these parts. A person on either side of the car, by catching hold of one end of the handle O, can raise or depress the coupling-pin without having to go between the cars, and thus risk life and limb.

In order to lock the pin in a raised position, and thus prevent the cars from coupling, except when it is desired that they should, the rod N is given an endwise sliding movement through its bearings, so that the arm L can be made to catch over or be detached from a projection on the side of the draw-head. When the arm is made to catch over this projection, the lower end of the crank is forced forward in such a manner that the coupling-pin is raised to its highest position, and is locked there so that it cannot fall and couple the cars when they jar together. In order to detach this arm from or make it catch over the projection, the rod N must be moved endwise through its bearings.

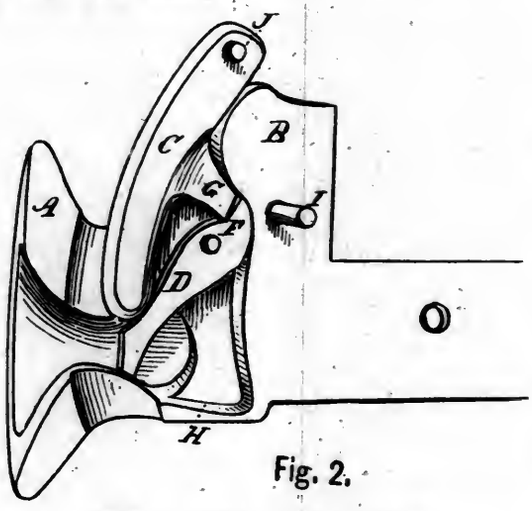


Fig. 2.

THE ROBINSON CAR-COUPLER.

In order to couple and uncouple from the top of the cars, the lever Q (Fig. 1) is used. This rod is slotted at the point where the pin or bolt R passes through it, so as to allow the rod an endwise movement for the purpose of operating the rod N. In the lower end of this rod Q is made a suitable slot, S, where it catches over the

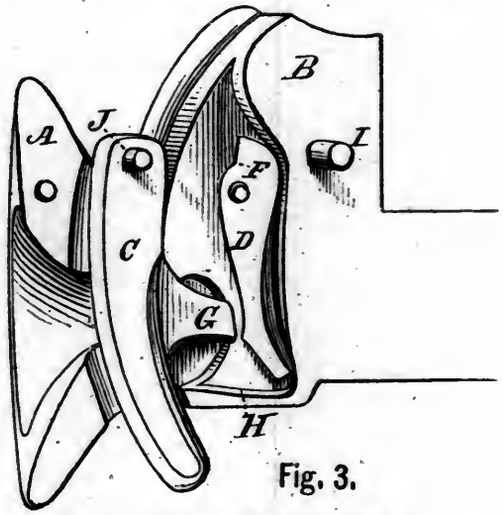


Fig. 3.

THE ROBINSON CAR-COUPLER.

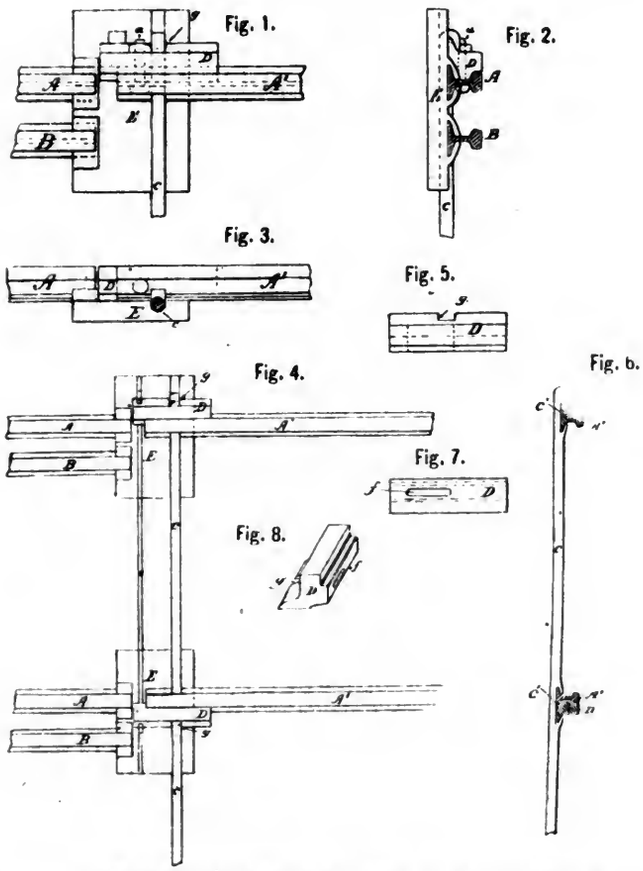
bent end of the rod N, so as to allow a free movement between the parts. A person standing upon the top of the car, can, by this rod Q, both move the rod N endwise and partially revolve it, so as to raise or lower the pin.

It is claimed by the inventor that this coupler will couple to any old-style coupler; that it will operate upon a curve, and that any possibility of breaking or straining the link is avoided. The pin being fastened to the draw-head, it cannot be lost, and the use of the old-style bumper or dead-head is obviated.

A. C. Woolman, of Bellefontaine, O., is the agent of the coupler.

Chamberlin's Railway Track and Switch.

CLARK D. CHAMBERLIN, of Cañon City, Colo., has recently invented a device relating to improvements in railway tracks or switches in which provisions are made for carrying the car-wheels over openings left between the end of rails at switches, made necessary by the longitudinal extension of rails in warm weather and the contraction of the same in cold weather. The objects of the improvements are more particularly to provide means by which



CHAMBERLIN'S RAILWAY TRACK AND SWITCH.

wider openings may be allowed between the ends of rails at switches, and at the same time to carry the car-wheels over such spaces without jarring the cars and without the destructive wear on the ends of the rails common to the present method in use.

The accompanying cuts illustrate the device and its operation. Fig. 1 is a top view; Fig. 2 an end view; Fig. 3 a side view, and Fig. 4 a top view of the entire track. Fig. 5 is a detailed top view of the bridge-rail; Fig. 6, a detail of the switch-bridle; Fig. 7, a side view of the bridge-rail, and Fig. 8, a perspective view of the bridge-rail. The reference-lettering is similar throughout.

The main-line rails A, and the side-track rails B, are permanently attached to one side of the switch-chairs E. The latter is provided with slots for the reception of the switch-bridle *c*, which retains in place and operates the switch-rails A′ and bridge-rails D. The bridge-rails are made from any suitable metallic substance, and extend from the ends of the rails A back along the sides of the switch-rails A′, to which they are attached loosely by means of the pins or bolts *a*, which slide in the longitudinal slots *f* of the bridge-rails. The bridge-rails may be made sufficiently higher than the main rails to meet the tread of the car-wheels when the latter are flaring.

The bridge-rails and switch-rails are placed in position by first placing the switch-bridle *c* in the slots made in the chairs to receive them. The bridge-rails are then placed in the slots *c′* of the switch-bridle *c*, and the switch-rails A′ are slid into the slots *c′* beside the bridge-rails D, when the bolt *a* may be placed in position, as shown in Figs. 1 and 2. The bridge-rails D have notches *g* made in the flange, into which the switch-bridle locks in the manner shown in Figs. 1 and 4, which prevents the bridge-rails moving endwise, always retaining the bridge-rails in immediate proximity with the main rails A and the siding rails B. As will be seen, this construction will admit of the rails of the track being made sufficiently short to prevent their being forced together by the expansion, which frequently forces the ends of the rails together so tight as to prevent the working of the switches. Should the flare of the surface of the car-wheels have a tendency to force the bridge-rails outward, a bridle-rod *e*, may extend from the outside of the bridge-rail at one side to the outside of the bridge-rail at the other side, as shown in Fig. 4. The bridle-rod would be made to slide in grooves provided in the switch-chairs for that purpose.

The Dudley Dynagraph Car.

THE car perfected by Mr. P. H. Dudley for automatic or mechanical inspection of railway tracks is very ingenious. By delicate machinery connected with the axle of the car by belts or cogs, every vibration, tilt, or perpendicular variation in the position of the car is noted on paper with pens set for the purpose, and the record thus made is reduced on paper by the expert in charge, who thus far has been Mr. Dudley himself. Thus a complete and accurate chart of the track in profile and alignment may be submitted to the section superintendents, showing not only the amount and kind of work required to perfect the road, but also the precise places referred to mile-posts on the road where work should be done. The registration of these machines is so perfect that Mr. Dudley can, if the rails are comparatively new, tell, when passing at the rate of twenty miles an hour over a railway, what mills rolled the rails on which he is riding, and knows at once when passing from rails of one manufacturer to those rolled by a different maker. From the record thus made Mr. Dudley makes up a profile map of the road, which, by curved lines, shows, on a scale of one-quarter inch to the mile, the following things: 1. Any irregularities of gauge along the line. 2. Defects in horizontal alignment of the rails. 3. The grades along the railroad. 4. The condition of the track at any point, compared with a perfect track. 5. Whether and how much the track can be improved by labor, or whether new rails alone are needed to make it more perfect. 6. The brand and kind of rails used on each mile of road. 7. The number of years each rail has been in place. 8. The comparative percentage of tangents and curves per mile of road. This map, completed, costs $2.50 per mile, the high price coming mainly from the immense amount of work required to interpret the results, and the delicacy and cost of the instruments used in the work. Mr. Dudley is the inventor of all his instruments, and inspects each year from 6,000 to 10,000 miles of track, living

on his car during these trips. From 3,000 to 5,000 "miles" of paper are kept in the car constantly, and fifteen gallons of ink per 100 miles of track are used in "spotting" low places. The car has recently been employed with great success on an inspection of the Boston and Albany Railroad.

A New Motor.

ACCORDING to the *Boston Transcript*, much interest is felt among experts and others who are concerned in the manufacture and the use of steam-power apparatus in the successful working of the new method of developing steam-power which is being introduced by the New England Motive Power Company of Boston. The apparatus is in constant use at the works of the Hallowell Granite Company, on Medford street, in the Charlestown district. It has been in use there some ten weeks, and gives entire satisfaction in respect both to the economical development of power and the saving of fuel, *i. e.*, about fifty per cent. of coal is saved, and the same amount of power is now developed by the use of one boiler of fifty-horse power, that formerly was produced by this boiler and another one of thirty-horse power. The new method is not, however, wholly a matter of improved apparatus. The chief factor in the gain that is made consists in the mingling of a certain proportion of methylic spirits or pure wood alcohol with the water for the boiler. The proportion has been varied in different experiments, but the engineer of the granite company has derived results most satisfactory on the whole by using ten per cent. of the spirits. The gain comes from the element of alcohol. There is no special virtue in this particular kind of alcohol, and the ordinary alcohol of commerce would serve as well, and might be preferred if it were as cheap. The advantage is that the admixture of alcohol permits the water to be vaporized at a considerable lower degree of temperature, namely, at 169 degrees of Fahrenheit, instead of, in case of water simply, 212 degrees. The apparatus does not require any different boiler construction, but it is an outside attachment which may be adjusted to any boiler. By means of it the compound of water and alcohol may be used over and over again during a period of weeks, so that the cost for alcohol after the first outlay is very slight. The apparatus consists mainly of a condenser in combination with three cylinder pumps. One cylinder is to exhaust steam into the coils of the condenser, and another carries outside the coils a volume of salt water drawn directly from the dock alongside the engine-house. The third is the vacuum cylinder, which is of service in returning the condensed vapor to the boiler. This vacuum cylinder serves also in another way by relieving the direct internal pressure of the boiler, so that while under the former method a pressure, as indicated by the steam-gauge, of sixty-five pounds were employed, forty-five pounds are now found to be sufficient. Another advantage appears in the use of the alcoholic combination in the gain of time required for getting up steam, but about half the time formerly required being now needed. A series of practical tests of this invention—which has been patented here and abroad—is now in progress at the Navy Yard in Washington, and a report, giving results measured with scientific accuracy, will probably appear at an early date.

A Remarkable Invention.

FROM Bridgeport, Conn., comes intelligence of a remarkable invention. It is to do away with the unsightly cow-catcher and make the railroad track a safer place to walk than your own door-yard. It is called the "life-saving engine-pilot." The following lucid description of the contrivance comes from the home of the inventor, and may be considered authentic:

"Mr. Rosenfelt, the inventor, says that the idea of such an appliance first occurred to him by seeing the mail agents on the postal-cars grab the mail bags with the appliance attached to the side of the car. He thought if a bag could be caught by an iron fork and spring without damage why could not a man be handled by making the cushions so soft that his person could not be injured. He has experimented some time, catching chickens and dogs to begin with. He finally perfected his invention sufficiently to pick up his children without harm, and lastly, in testing his invention, it has been attached to a locomotive, and, while running at the rate of forty-five miles an hour it has picked up Mr. Rosenfelt himself, and landed him upon the spring-mattress without harm.

"The life-saving pilot resembles an enormous open work funnel. The mouth opens wide enough to cover the rails. Light steel strips converge toward the entrance of a canvas chute. These slats are delicately balanced and backed up with a number of buoyant springs. The person to be picked up will be scooped, so to speak, into this airy funnel with such a delicate, easy motion as to prevent any concussion. The momentum of the engine will carry the man, woman or child up over the engine, through the canvas chute, and pass him or her on a spring-mattress in the first passenger-car.

"The conductor, it is to be supposed, will collect fare, and, as people will be picked up in this way between stations, they will be expected to be provided with mileage tickets. A colored porter will always be found waiting at the opening of the chute with a whisk-broom and a pitcher of ice-water.

"It seems to us that the only weak point about this otherwise wonderful invention is the fact that it does not discriminate between men, women and children, and mules, cows and calves. It is as liable to pick up one as the other and land them by way of the funnel and deposit the aforesaid mule, cow or calf upon the spring-mattress in the first passenger-car to the consternation of the passengers and the conductor, who will be at a loss how to collect the fare from the quadruped."

To Temper Steel on One Edge.

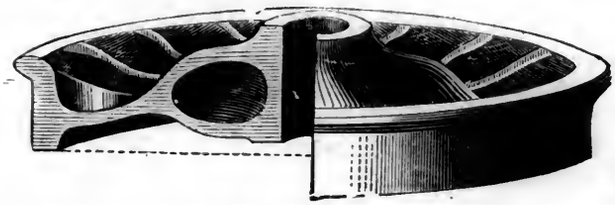
RED-HOT lead is an excellent thing in which to heat a long plate of steel that requires softening or tempering on one edge. The steel need only be heated at the rate required, and there is little danger of the metal warping or springing. By giving sufficient time, thick portions may be heated equally with thin parts. The ends of wire springs that are to be bent or riveted may be softened for that purpose by this process, after the springs have been hardened or tempered.

THE Swiss railway companies now cover a portion of their carriages with a phosphorescent preparation which makes them visible at night.

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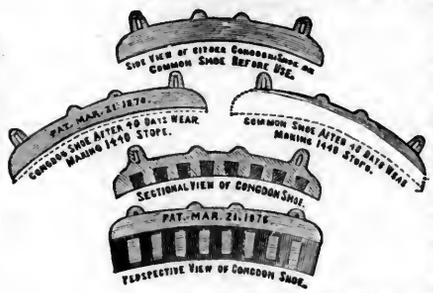
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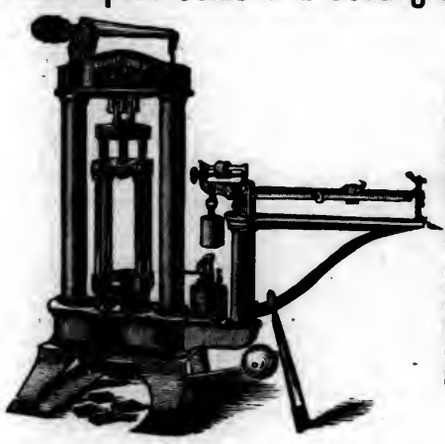
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JNO. N. ABBOTT, Gen'l Pass. Agent, N. Y.

American Railroad Journal.

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RAILWAY STATION ARCHITECTURE.

BY CHEMIN DE FER.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN a recent number of the JOURNAL I discoursed briefly upon the subject of railway art, urging upon railway managers in general a closer attention to the eternal fitness of things in the principles of decoration than is ordinarily paid. Incidentally I touched upon the subject of the construction and appearance of railway stations as being germane to the topic under discussion, but purposely avoided an extended comment thereon, for the reason that the subject of railway station architecture is of sufficient importance to merit a discourse of its own.

Imprimis it may be stated that a railway station is a necessity, and therefore its construction should be commenced with the idea of utility most prominent in view. Whether the station be an enormous and palatial structure at the terminus of a trunk line in some great city, or whether it be but an humble little shed at some country hamlet, if it is built for use, and whatever of luxury there may be about it must be the luxury of usefulness. But nevertheless in the architecture of railway stations it must be borne in mind that the principles of true art demand consideration. In a city the railway station should be essentially a city building, in character with the buildings surrounding it. Philadelphians are rather proud of the new Pennsylvania station on Broad street, and the Pennsylvania road has probably found the expenditure of the money necessary to construct it a profitable investment; but had the road constructed a barn-like building on their commanding site, fronting in all its rusticity the towering pile of marble forming the municipal building, it is highly probable that the sensitive Philadelphians would have loudly rebelled at such desecration. To a great extent a railway is under obligations to a city, and the construction of buildings that are eyesores is manifestly improper, to say little of its being poor policy. For a like reason a country station should be in thorough harmony with its surroundings. There are many outlying towns on the line of railways, where city people have constructed cottages and villas for summer residences, and a most depressing sight is frequently presented at one of these towns, in the shape of a contemptible little shed serving the purpose of a railway station. It is not uncommon, on the other hand, for railways to select eligible points along their lines where there is not a single residence in sight, give them attractive titles, parcel out the land in building sites and erect charming little stations surrounded by flower-beds and gravel walks, trusting to the attractiveness of the spots for the growth of towns and the consequent increase of travel. With scarcely an exception this reliance on an outcome of the future is justly based, and within a radius of fifty miles from New York City there are as many pretty little towns owing their existence to railway enterprise in this direction, and I maintain that the artistic railway station is the chief bait for the railways to hold out. The city traveler, reading his paper or dozing in his comfortable seat, is not likely to view the surrounding territory while the train is whirling him to his destination, especially if he be accustomed to travel; but instinctively he will gaze out of the car-window at every station if the road be not one upon which he frequently travels. The first thing he looks upon is the railway station, and here is where the first impression is apt to be lasting. If the station belong to the first-named class of dismal, dirty little boxes, surrounded by mud and ashes, he will turn wearily away, and no amount of after persuasion will convince him that a town whose access is obtainable through the miserable little station in question has any charms in compensation. But with an eye attracted by a tasteful little Queen Anne cottage, peeping out from a mass of refreshing and many-hued foliage, he is quite ready to believe that the whole town is a most delightful spot, and is even prepared to wager that the water thereof is of excellent quality and the sanitation perfect, without sampling the one or inspecting the other. Such are first impressions and such is unreasoning man.

It may be said with truth that no railway company is justified in going to the expense necessary to equip all the towns along their lines with stations coming up to the requirements demanded by the true artist, but if economy must be practiced, for heaven's sake let it be practiced in the quantity and not the quality. Many railway stations are much larger than the occasion demands, and appear to be built with reference not so much to present requirements as to the needs of a future generation. In every respect a small station is better adapted for a small town, than a disproportionately large one, difficult to keep in good order, and lacking the appearance of snugness which is a great charm. The cost of construction of a small station tastefully arranged, and with an eye to economy of space, would be no greater than that of the ordinary shed which too frequently mars a railway landscape.

Regarding the interior of railway stations, comfort and convenience to patrons are the most essential considerations. The ventilation should be thorough and effective, and the sanitary arrangements subjected to careful attention. There should be a plentiful supply of water both for drinking and sewerage purposes, and the drainage should be kept free from obstruction. In Winter the heating should be accomplished without roasting the waiting passengers, and the temperature kept as close as possible to the ordinary temperature of the cars. Architecturally the decoration of the interior of railway stations should be suggestive of comfort and utility, and fortunately these can be obtained with but slight cost. A separate waiting-

room for women should always be provided, if it be but large enough to swing a cat in and a small cat at that, for though a railway station is but a temporary abode, albeit it is sometimes a haven of refuge.

In connection with the general architecture of railway stations a few words may be said as to the construction and arrangement of the adjoining platforms. Fortunately for mankind the raised platform, level with the steps of the cars, is fast going out of existence, its disappearance in some instances accelerated by State laws. This style of platform is properly regarded as a death-trap, and the perilous gap between the cars and the planking has been the cause of more than one fatal disaster. Experience has demonstrated that a platform flush with the rails is by far the safest, and if the platform be narrow, allowing but a short distance from the station to the cars, it would be well if the floor of the station were also on a level with the platform, thus avoiding the necessity for ascent or descent which in slippery weather might be attended with disastrous results.

To a great extent whatever may be said with reference to passenger-cars as bearing upon the comfort of the traveler, may also be said about railway stations, for I take it that they are in a certain sense stationary cars, answering a similar purpose to that of the railway vehicle. The architecture of stations affords an interesting study for the architect and also for the railway manager, and is properly receiving more attention than formerly; but differing from the passenger-car, there is more room for the artist than for the mechanic, and a greater scope for originality and variety. Bearing in mind the absolute requirements of a station, the architect has a wonderful chance to beautify the scenery of a road, and the more unattractive the general features of the surrounding country the better will his efforts be appreciated.

A TRIP OVER THE NEW YORK CENTRAL AND LAKE SHORE TO CHICAGO.

BY CHARLES H. E. REDDING.

[Written for the AMERICAN RAILROAD JOURNAL.]

THERE is a little anecdote related of Corning, I think, when he was potent in Central management. He believed in allowing the greatest latitude of action to his subordinates, provided always, such action was in the line of his desires. There was once a question of the color of cars. Both Corning and the master car-painter held decided views. It is said that Corning told the painter that it was his wish that there should be the completest liberty in such matters, ending with, "Now, Mr. Painter, there are your cars; go ahead and paint 'em any —— color you please, so long as you paint 'em red!" The Central magnates of to-day are willing to allow the traveling public an equal liberty of choice as to routes to the West. Go West, they say, by any route you may prefer so long as you go *via* the New York Central and Hudson River Railroad. There was a time not so remote as to have been obliterated from the memory of the present generation of the traveling public, when Central was not overnice in the accommodations provided for first-class travel. The more emphatic and choleric were wont to stigmatize the rolling-stock in most unseemly language, and it is an undoubted fact that the management made enemies with undesirable facility. Perhaps it was due to a change of heart, peradventure it was active competition, but whatever the compelling motive, the excellent fact is vividly apparent that to-day the wayfarer is treated nicely, there is a perfectly patent solicitude for his comfort and convenience, and some apostle of good manners has labored with the servants of the road, bringing forth the pleasing fruit of civility, courtesy, and an endeavor to make themselves useful to passengers.

Recently the writer, through the courtesy of the officers of the Central and Lake Shore roads, made the trip to Chicago for the express purpose of noting such changes and improvements as should fall under his notice.

The start was made under repellent conditions. It was intensely cold. The train was a heavy one, made up of a string of ponderous sleepers, with day coach and smoker. With favorable weather it would have been a heavy load, requiring a stout engine to pull it through on the fast time scheduled for the train, yet, in the whole distance between New York and Buffalo, only forty-five minutes were lost, and Chicago was reached strictly on time. Considering the difficulties of railway service when there is a blizzard constantly in front of you, it speaks well for the motive power and management that such should be the case.

The Wagner cars that, erstwhile, were not perfection on wheels, have also responded to the note of progress, and are now not only artistic in their internal fittings, but what is more important, extremely comfortable. They seem to be hung up and adjusted on their springs more perfectly, as they ride much easier. This is not due entirely to excellence of road-bed, as the Central and Lake Shore have, at all times, been particular in this regard to the minutest details; hence it is clearly just to ascribe an improvement to the Wagners, with due credit.

The day coaches of both roads have, likewise, felt the influence of the master car-builder, as shown by cars of an improved design. Both roads supply cars with greater window space, a better proportion of the clear-story, roomier and better upholstered seats and a general interior effect of roominess and light that is most pleasing. A very desirable feature is the end ventilation of the cars, whereby a supply of fresh air may be admitted without creating draught, at the same time securing a circulation of air that is, more than any other one feature, least scientifically looked after on most roads. The notion that vitiated air will pass out, and cold air flow in simultaneously, through side ventilators, while a train is in motion, may be theoretically correct; but it is a mournful fact that it does not work in practice to the satisfaction of passengers. Entering the cars of either of these roads from the clear air outside, one is not sickened with that stale, second-hand atmosphere that has done duty several times. It is no economy to breathe the same air more than once, when one considers that the atmosphere surrounding the earth is forty miles deep; and it is decidedly unpleasant.

A very important point to be considered by the through passenger, is the fact that all connections are made in union stations, and luggage receives less than the usual rough usage, as it, also, is placed in a through baggage-car in New York or Chicago, and bulk is not broken, either way, until final destination is reached. The merciful man is merciful to his trunk, and he is glad to see it restored to him not indistinguishably battered.

Under the most favoring circumstances, a ride of a thousand miles is not without monotony, but I know of few more interesting rides than the journey over the Central and Lake Shore. The Mohawk Valley is not "grand," but it is certainly picturesque and full of historic interest. Besides no two roads in the country pass through so many large towns and cities, so that one's attention is constantly alert and occupied. The local travel on both roads is really large, and there is all the amusement of seeing your fellow man as "others see him," until you finally reach your journey's end in a pleasant frame of mind due to the incidents of the trip, the comfort of the conveyance, the thoroughness of the management that has catered to your comfort, the excellence of the dining-halls, and the politeness of the officials.

ATTENTION TO DETAILS IN RAILWAY TRAVEL.

BY MARVIN C. WILLIAMS.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT is probably safe to say that whoever has bought and used a ticket on any of our railway lines has in one way or another, been forcibly struck with the lack of attention on the part of the companies to the smaller details and less noticeable points of comfort in the management and system of their respective lines. There are companies who give every evidence of an entire readiness to run and manage their roads on the most liberal basis. There is no sign of any effort to economize or save money in any department, however apparently insignificant. On the contrary in some instances there is a lavishness and display of ornamentation and embellishment that would seem to indicate an absolutely reckless expenditure in a direction wherein it is difficult to see that the investment could in any way be justified by an expectation of a fair return. But it is in this ornament and decoration that the principal so-called improvements are made. Coaches of an ordinary way accommodation are with us far handsomer and more luxurious than the special private carriages dedicated to the sacred use of the crowned heads of the various countries of Europe. They abound in a profusion of mirrors, carving, painting and solid woods. The light fixtures are in the latest and most approved artistic forms of brass and copper, while even the hand-rails of the platforms are nickel-plated. Gas is burnt in the lamps, and it is even possible for travelers to read by its light after nightfall, whereas in other countries, failing daylight, the unfortunate occupant of a compartment must rely on his memory for literary recollections, or be content to do without entertainment of that nature.

Compared with other countries, we are, it is true, infinitely in advance in both the ornamental and comfortable features of travel. What would an American, accustomed to travel on our roads with their varied conveniences and advantages, think of being thrust into a small space with two benches facing each other, and knees touching; the weather biting cold, and the only palliation of the latter a small flat leaden can filled with warm water, which in the course of half an hour becomes an admirable refrigerator, but could be of little use for any other purpose; and the window glasses begrimed with filth, showing indisputable evidence of not having enjoyed the luxury of ablutions since they were first put in use, saving and excepting such involuntary washing as heaven might have seen fit to bestow in the form of rain. Compartments on European railway carriages are used one day for smokers, and on the next for ladies only, without any intervening renovation, with the result of a general collection of ashes, burnt matches, and half-burnt cigars and cigarettes on the floor.

This may be far from pleasant, and it is true, far behind the arrangements securing cleanliness and neatness with which we meet on our continent, but we are still by no means where we should be, especially in the question of what may be termed small comforts. No one will for an instant deny that it is very pleasant, while being whirled through a beautiful or interesting section of our continent to be comfortably seated in a coach belonging to one of our "crack" lines, surrounded by all that is beautiful and artistic, the windows of the finest and clearest plate glass, and reclining on a seat of softest plush, one's feet outstretched upon a handsome mat or carpet. But in Summer the advantages of the French plate window are more than over-weighted by the fact that under no inducement can it be persuaded to permit itself to be raised, and in the parlor-car in Winter the softest and most charming mats or carpets by no means balance the intolerable discomfort of having one's feet in an ice bath, and one's head in a Turkish ditto. Again in passing through a beautiful or historic section of country where local names call up recollections of well-known scenes and incidents, much of the satisfaction and gratification which might otherwise be obtained is ruthlessly destroyed and blotted out by the hopelessly unintelligible howl of some brakeman, on whom the traveler had been relying for his information as to the nomenclature of the various stopping places along the route, and by the subsequent maddening mental exercise of endeavoring to apply some translation to the barbaric conjunction of sounds apparently intended to signify some station.

The courtesy or rudeness of a conductor, may, when viewed philosophically, be but a matter of trifling import, but it is by no means easy to keep the temper placid and unruffled under the unjustifiable impertinence of some train monarch, and the enjoyment of an entire trip may readily be wiped out, and the milk of human kindness turned to gall, by a discourteous and disobliging answer to some simple question.

A civil and pleasant conductor and train-crew could render a regular evening train of cattle-cars far more popular with he patrons of the road, than would be possible with men of a reverse disposition in a line of Pullman coaches, replete and overflowing with every known and unknown luxury of modern railroading. There is nothing that so much contributes to the reputation and popularity of a railway as the courtesy of its and the public servants. Travelers would not hesitate an instant between plain courtesy and magnificent insolence.

These specially enumerated elements of popularity are within the reach of all roads, and above all are a mere question of discipline, not involving an extravagant outlay of money, as in the case where mere beauty and artistic finish is relied upon to make a name for a road. A traveler has an indisputable right to expect a courteous demeanor and treatment on the part of the men whose salaries he pays, but seldom does he obtain it. It

seems almost incredible to the individual when he meets with some conductorial insolence, and futilely lodges his customary complaint, that the road should blindly neglect so very obvious an element of success and popularity; yet so it is.

The features of railway travel which really most conduce to personal comfort, are those which do not demand any special outlay on the part of the company, but simple rigid rules, which should be absolutely enforced, demanding that its servants should treat those under their care as what they truly are, their masters and employers, and give them that respect and attention to comfort which is due to their relative position.

It is in the smaller points, such as are enumerated, that a wise management could, with a perfect economy, make its road justly popular. Clean cars, courteous servants, equable temperature and a general attention to the smaller details of travel, would render a poorly-equipped line to another neglecting these most salient features, a truly formidable competitor.

THE PAINTING OF PASSENGER-CARS—LIGHT VS. DARK COLORS.

BY R. MC KEON.

[A Paper read before the Master Car-Painters' Convention, Boston, Mass.]

THE manufacture of railway cars is a great and growing industry, and as the increase in mileage goes on the demand becomes greater. We therefore see the importance that attaches to passenger-car building, as well as to the general repairs of all classes of cars in our railway shops, and which requires that each department of the work be placed under the supervision of practical men who have acquired a knowledge of their trade in the car-shop, and are well acquainted with all the details of the construction and finish of cars. Each of the several departments calls for mechanical ability and good management on the part of those in charge, so that a system of working may be followed that shall produce the best results with the least expense.

The painting of railway cars is progressive, and to-day commands equal attention with the other departments whose duty it is to care for the rolling-stock of the road, and progress is expected to be made by those who are intrusted with the supervision of the paint-shop. We are not merely to follow in the wake of those who may have gained some little notoriety for their success in work and management, but we should reach out in search of improvement, our aim being to make some progress in the art. The painting of a first-class passenger-car is of more importance than many of our railway officials may at first thought imagine; at least it would seem to be so from the fact that it is frequently the case that the time taken to paint a car is considered as so much loss of service of the car to the company, when a little investigation would convince them of the necessity of proper time being allowed to do the painting, which, when done, would be alike creditable to the road and to the shop.

Cars are painted not only to add to their beauty and attraction—two important points in painting—but are painted for their preservation. The appearance of a car plays a very important part in the traffic of a road. Many of our Western lines have built up their reputation on the interior finish and decoration of their cars, as well as in the good taste shown on the outside painting; for let a car be devoid of beauty and faulty in design, or bad taste be exhibited in its finish, and it is not suitable for the place it was intended to fill. It is, therefore, a wise policy for railway companies to show a reasonable amount of pride, and the paint-shop is one of the places in which to study out the tastes of the traveler, and to blend together in harmony the colors and designs which will please the eye and command the approval and the patronage of the public. But how shall we economize in car painting? That is a very important question, and, in fact, is the leading question of the day, not alone in the paint-shop, but in all other departments engaged in the building and repairs of cars, and it will be our object at this time to show the management of our roads how to save expense on the passenger-car painting by referring them to practical tests, together with an experience of one-third of a century in the railway paint-shop.

During the past fifteen years a considerable reduction has been made in the cost of painting, and the credit, we think, is in a large measure due to the labors of the Master Car-Painters' Association, who will continue their efforts to further reduce the cost of work and to show where economy may be introduced without detracting from the wearing qualities or the durability of the painting. The color of passenger-cars for some years has been hard to decide. No fixed standard has given entire satisfaction, and numerous changes have been made. I know of roads that have had four different standards of color in the past twelve years, but they were all of a dark shade. The consequence is that very few roads have their cars all of a color, which does not show very good taste, and certainly not good judgment on the part of those who had the power to make the changes. Therefore we think that a uniform standard of color on all passenger-train cars of a road would be the most important step ever taken towards economy. I am decidedly in favor of light shades of color for passenger-cars. A long experience in their use has convinced me that it is economy to use white lead for a finish. It is true that dark colors have been popular of late years, so much so that many hesitate to advocate what they know to be the best for wear, but we should not be tied down to any standard of color or method of working when we are convinced that it is not producing good results. We must seek for something better, embracing every opportunity to add to our knowledge of the pigments employed, for unless we exhibit such an interest in our labors we are not fulfilling the entire duty we owe to those who employ us. There are too many men who fail to advocate economy and who follow the method that is indorsed by some leading road or shop, in place of showing in their work by practical facts what benefits would be gained by making a change in the methods employed, and, instead of adopting a standard of color at the simple suggestion of some road official, first take into consideration the value of such color, its adaptability to the work and whether it would be for the interest of the road to adopt it, when a plain statement might be made setting forth their objections to the pigment or color proposed to be used.

The painting is about one-twelfth the cost of a first-class day coach, which includes labor and stock, and must be renewed from time to time; and being a protection to

all other parts of the work, it must be watched carefully and treated at the proper time, or we not only destroy the painting and the decoration, but neglect will ruin the entire finish. Twenty-five years ago, and later, most of the passenger-train cars of our principal roads were painted a light color—yellows of different shades being generally used. White lead was the foundation and the finish of the car, and lead in those days was manufactured honestly; it was not thrown on the market half corroded and poorly ground in cheap adulterated oils, as we find it to-day in many places (although I am glad to learn, from those more fortunate than myself, that a few reliable manufacturers still exist). But a change came in the color of cars, and changes are not always beneficial; competition brought out new colors, anything for attraction, and a ground work was introduced for the sole object of setting off the decoration on the outside of the car to greater advantage. Economy was not thought of; it was a matter of less importance in those days than now; but a change was made from the straw colors to the umbers or darker shades, which involved an expense of one-third more in the first cost of painting, while the life and service of the car was one-third less than it had been with the light colors.

We do not attribute all the saving in expense to the use of light colors, but just as soon as a change is made from a lead finish to any of the popular shades, such as umber brown, chocolate, Pullman color, olive and Quaker green, Tuscan red, or, in fact, any color where no lead enters into the mixture, then we lose at once the wearing quality, for it is the exposed surface of a paint that tells. This is the protection to the entire body, and a lead foundation will not help the finishing color if composed of the pigments we have named, but carry the lead all through and we have a durable surface, we have a car painted that will pay for the labor expended on it, and we wish the companies we represent here to-day might be convinced of the facts of our argument in favor of straw color on their passenger-cars, which is the first step toward economy in the painting department of their road. We can show them that this is where a great saving might be made, and with more care in the purchase of paint stock, we can assure them that they would have more cheerful and attractive cars in place of the dingy, dull and lifeless ones which now confront the traveler in many of our railway depots, and the varnish on such colors would also retain a luster much longer and do better service by having the lead finish for a foundation.

While speaking of the superiority of a pure white lead over all other pigments, I would state that no other pigment bears more oil; it is of itself an oily nature; therefore pure linseed oil combines with it better than with any of the vegetable or earth pigments. No one will dispute the fact so well known to all painters, that a lead pigment is more durable and forms a denser coating than any other employed in the paint-shop. A solid body, and one that has depth to it, is the main object in a paint; this guarantees durability. A coat of Tuscan red may have coloring-matter sufficient to cover the work, but that is simply a stain; there is no wear in it; but lead gives a solid foundation, and will hold out the varnish well on its surface. Being less porous or spongy than other pigments, it acts as a protector, for varnish does not decay altogether on the exposed surface; the absorption under it which takes place in all vegetable and earth paints, as well as in chemical productions more than in lead, draws the oil as much perhaps as light and air does on the surface.

Heat is the great enemy of paint, and such colors as are in general use on passenger-cars draw the sun's heat. which burns the oil and the life out of the varnish and paint. By repeated tests of light and dark colors, we find that white presents the coolest surface in a hot sun, and black the hottest. A gradual scale may be run up, and the heat-absorbing power increases as the colors become darker, the effect being to expand and soften the darker colors. A continual heat would make the paint and varnish elastic, and while in this state, were it suddenly exposed to cold air, the contraction would crack the painted surface; but take a light color and put it to the same test, and we find that it does not draw nearly the same amount of heat, nor a sufficient quantity to soften the paint and varnish.

I know that it is argued that our railway managers prefer the colors they use, and we should, therefore, try to make them as durable as possible. We would not for a moment deny them the right to their choice of color, and we have always labored to secure the best results, but the experience many of us have had with such fugitive colors is far from satisfactory. We can say for light color that it has less absorbing power, hence its durability and less liability to injury by solar heat, as dark shades, or the reds which are so common on coaches the last few years, and which suck in the heat and moisture, making but feeble resistance to the attack of storm and cinders, having no solid body to resist the sudden changes of weather. Why, then, persist in the use of pigments that are so easily destroyed, or rendered lifeless and dead by constant exposure? But I am aware that some claim the heat theory to be only imaginary, and therefore I do not advance these arguments in favor of light colors simply from my own experience, but I have the practical views and experience of car-painters in various parts of the country, and the large majority tell me that the life of a dark color on a car, particularly in the Southern States, is less than half what a buff or straw color is. The dark color in one case referred to is of an olive shade, which I am informed the heat soon changes to a deep black olive, and frequently the dark cars have to be repainted after only twelve months of service, the paint being too far gone to revarnish, while the buff-colored cars run from eighteen months to two years, and then clean up well and are revarnished.

What shades of color suitable for cars will resist the deadening effects of solar heat the best? We have the various shades of straw, lemon, cream, deep gold, old gold and buff. Many shades may be made between a pure white and an orange, in all of which white lead predominates, and the best brands of chrome yellow and yellow-ocher with venetian red. No shade of color should have the strong yellow cast that we have seen on some roads; it should always be toned down, which enriches it. These colors will outwear any of the dark colors or reds now in use fully one-half, or in other words, a car painted yellow will do good service, when first painted, for eighteen months before requiring to be revarnished, while the dark or red colors will last but twelve months at the most.

Light colors retain the oil a greater length of time; and that dark colors absorb and retain heat has been proved by numerous tests. If lampblack and white lead be

placed side by side, the absorbing power of the black is 100, while that of the lead is only 53, the reflecting power of the lead being 47. Cloth of different colors placed on newly fallen snow also shows that the white is the last to melt the snow.

In mixing car colors of a light shade, or straw colors, we find that a pure white lead is first necessary, which should be tinted with the best French ochre and English chrome yellow. This will make the most durable color for car-bodies; the chrome is permanent when mixed with lead, almost as much so as the best ochres, but it is far superior in body and covering properties, and one of the most useful pigments in the paint-shop. White lead alone will change from its original whiteness in case it is mixed with a surplus of oil; it is the oil which changes it to a yellow cast as it hardens in drying; but when lead is mixed with some other strong pigment, its color when thus tinted is more permanent, and its density and wearing qualities are increased. The durability of a color we do not claim to be altogether in the pigment employed, but it is equally so in the vehicles used in its preparation for use; therefore lead, which is known to retain oil the best, will hold the color longer.

Painting is put to the severest test on our passenger-cars, and its destruction is caused by a constant exposure to the elements and the changes of atmosphere, from a dry, burning heat through the day to a heavy moisture at night, which the painted surface absorbs in large quantities, to be dried out again, the same process going on day after day. But perhaps it is, as I have heard expressed by members, that the foreman painter is not consulted in regard to the color of the car. This is generally decided by those who know nothing of the adaptability of a paint to the work. Freaks of fancy have too often determined what the color of the car should be, with no thought given or questions asked of those who are expected to know the difference in the lasting qualities of a color, nor is the question considered whether a color would wear six or twelve months. Would it not, therefore, be economy to ascertain what amount of wear is in a color before it is finally adopted as the standard of the road?

Our arguments in favor of the light colors probably will not change the views of the officers of our roads. They may, however, find the matter worthy of their attention, and, to test it for themselves have one coach painted any light shade, and put it in service along with a car painted Pullman color or Tuscan red, when twelve months' service will prove what I have already asserted, that light colors are the first step toward economy in the car-painting department of a road.

THE DANGERS THREATENING RAILWAYS.

MOST of the difficulties that have surrounded the railways in the past may be attributed either to causes inherent in the system or to the irregularities of those that have secured temporary control of them. The embarrassments with which they will have to contend in the future, it appears to me, will be of a somewhat different nature, though to a certain extent growing out of past evils. Some of these may be stated as follows:

First. The burden of unproductive branches that they have acquired by lease, purchase or construction, which do not earn enough to pay their fixed charges.

Second. Oppressive legislation. If any one doubts that there is danger from this source, let him examine the calendar of any of our State legislative bodies after they have been in session a few weeks, and note the number of bills that are hostile to the interests of railways. Each member appears to regard it as a solemn duty to his constituents to introduce at least one bill of this character during a session; and the extent to which this warfare has been carried on does not argue well for the future.

Third. The hostility of the press, which, in its strife for popularity with producers, shippers, and politicians, evinces a disposition to magnify every little evil in the system, and ridicule every effort in the direction of reform, by which course it practically encourages the communistic tendencies of the age. In the discussion of the difficult problem of railway transportation, which has been carried on through the press during the past fifteen years, the railways have not been allowed a fair presentation of their case; and even in courts of justice they have had to encounter much judicial prejudice engendered by the press in its uncandid statements of fact. The railway papers have striven faithfully to overcome the prejudices excited against the great interest they represent; but the general public do not read these papers, and therefore their efforts, read only by the railway officials, are like sermons to the converted.

A statement, published in the last number of *Poor's Manual*, does great injustice to the railway interest of the counntry. It says that "Stocks and bonds to the amount of $530,132,000 were listed at the New York stock exchange in 1883, * * * equivalent to about $80,000 per mile of new road built during the year." And then it adds, by way of explanation, "A considerable amount, however, of the securities listed was on account of old works." After explaining how so large an amount came to be listed, and what a large portion it really represented, the *Manual* proceeds to say: "It is in this immense increase of fictitious capital that is to be found the cause of the general distrust which prevails." The simple fact is, that the amount of bonds listed in any one year bears no relation whatever to the number of miles of road constructed during that year. An editorial was published in the Chicago *Evening Journal* a few weeks since, founded upon Mr. Poor's statement of the cost of the roads of this country, from which the following is an extract: "If the roads had cost only what it would cost now to build them, only one-half as much net earnings would be required to pay interest and dividend charges, and their rates for passengers and freight might be reduced in proportion."

While it is true that many items that enter into the cost of construction of a railway are to-day lower in price than they were a few years since, nothing like the reduction implied has taken place. If the remark applies at all, it would only apply to such lines as were constructed between 1869 and 1873. Many of the older lines could not be duplicated for double the sum they cost, and these constitute a large portion of the mileage of the country. But in this statement the writer entirely ignores a most important fact, viz., that the railways for the most part are not able, and do not attempt, on the basis of the present tariff, to pay any dividend or interest on a very large portion of the nominal capital referred to by Mr. Poor, and could not if they wished. Transportation charges are not based upon cost or value of road, but upon cost of

carrying, and are regulated by that inexorable law of trade known as competition.

Fourth. Increase of freight earnings, with a disproportionate increase in tonnage moved, showing that a larger amount of freight is being carried at lower rates. This is a noticeable feature in the annual reports of many of our large railways, published during the past three years, and indicates a general shrinkage in rates.

Fifth. The increase of operation expenses disproportionate to that of gross earnings, shows that the additional business is done without profit; or in other words it shows that the operating expenses have been brought down as low as possible. Forces have been reduced wherever it was practicable to do so; but until some reduction can be effected in the prices of labor (and this I believe to be inevitable, despite the promise of protection), no marked decrease in the percentage of operation expenses can be looked for.

Sixth. The clamorous and unreasonable demands of shippers, both as to rates and facilities, the extent of which can only be known to those that come more directly in contact with this class, whose claims are often presented with a degree of persistence and selfishness that places them beyond the pale of reason.

Seventh. The attitude of the railways toward one another, even in cases where their interests appear to be identical; as shown by the want of unanimity among their chief officials, and by insincerity in making, and faithlessness in keeping agreements; in winking at the trickery of subordinates, in cutting rates, in overloading cars, in under-billing weight, in paying rebates, and in making time contracts. "You have not kept your agreement to maintain rates, and have been getting more than your share of business," said one freight agent to another. "Oh, well," was the reply, "you keep the agreement, and I will keep the business."

Eighth. A foolish and unnecessary rivalry between the principal competing lines, resulting in a needless and continuous decrease in rates, and a consequent reduction in net income.

Ninth. Increased and indiscriminate issue of free passes. Even that class of passes known as "annuals," which were originally exchanged as a matter of courtesy, have proved an excessive annoyance to the officers issuing them, who would gladly discontinue an evil that they are powerless even to check.

Tenth. Popular prejudice against pools, concerning which there appears to be a great misapprehension in the public mind, though for protecting the interest of both shipper and railway alike, the plan seems to be the only feasible one. It does not, as many suppose, encourage extortion, nor does it countenance discrimination, but serves as a protection and as an equalizing power in the interest of both shipper and railway.

No one who has watched the course of events can have failed to observe that a marked disintegration in railway property has been going on during the past five years. Nor can it be doubted that, if the present condition of affairs is allowed to continue, a crisis is imminent. Many of the lines whose shares may now be classed as purely speculative, have already practically passed beyond the control of their managers. With others, the status of their ownership is so vague and indefinite that they appear to be rapidly approaching that condition. Certain others, though not experiencing actual embarrassment, are warned by the signs of the times of the necessity of retrenchment. In contrast with these, the prudently managed lines that have husbanded their resources in the past, stand out in bold comparison, and view (but not without anxiety) approaching events. But the railway system of the country, divested of its fictions and fungus growths, and guarded by a higher standard of morality, will, I believe, again shine out with renewed splendor, and, under a new and more stable order of things, will pursue the even tenor of its way in working out the grand problem for which it was designed.—[William K. Ackerman in *North American Review.*

CANALS VERSUS RAILWAYS.

THE idea that a system of canals can ever be worked profitably in opposition to railway transportation, is one that universal experience should have dissipated long before the present day. The results in England and on the Continent have been conclusive on the subject of the impossibility of canals being maintained and worked at a profit in the face of active railway competition. But if further proof were needed on the subject, we have only to turn to the United States, where canal transportation has been established and developed under circumstances most favorable for success. With an unrivaled chain of inland water communication, only requiring comparatively short links of connection to traverse the country in all directions, and with State aid given in the most lavish manner for their construction and maintenance, the history of American canals is almost an unbroken story of failures and disappointment. In a volume of Congress reports on the "Agencies of Transportation in the United States," recently issued, full details are given of every canal enterprise in the country, and some of the facts are especially interesting in connection with the effort now being made to sink a vast amount of capital in the construction of the Manchester Ship Canal. The summary given in the report is as follows:—

"The name of General Washington appears conspicuously among those who were early impressed with the necessity of providing a system of internal improvement that would unite the various points of an extended country, and bid them together in the interests of commerce. This system, in which he was a prominent prime mover, grew to a considerable magnitude, and, long after the introduction of the locomotive, there were those who looked upon the canal as the great highway of future traffic. Few are aware of the magnitude of the works that were planned and executed between the years 1825 and 1840.

"Adding together the totals of operating and abandoned canals, we have a grand total of 4,468 miles of canals, costing approximately $214,041,802. Of these, 1,953 miles are now abandoned, and a large portion of the remaining 2,515 is not paying expenses. This is largely due to railroad competition. All the canals in the New England States are abandoned for commercial purposes. The Middlesex Canal was, perhaps, the most successful up to the time of the construction of the Boston & Lowell Railroad in 1835, and it paid expenses and a dividend of about 6 per cent. for a number of years. The Oxford & Cumberland Canal, costing a moderate amount, did a fair business previous to the construction of the Portland & Ogdensburg Railroad.

The Blackstone Canal in Massachusetts and Rhode Island, passing through a rich region of country abounding in manufactories, was built in the best manner, but was never profitable. The Farmington and Hampshire and Hampden Canals sunk $1,089,425. In New York State, 356 miles of lateral canals, costing $10,235,314, have been abandoned; in Pennsylvania 477 miles are abandoned, costing $12,745,780; in Ohio, 205 miles, costing $3,000,000, have been abandoned. Indiana, with the aid of her creditors, constructed 379 miles of canals in 1851, costing $6,325,262, all of which were abandoned upon the construction of railroads along the lines of the canals. The most enterprising and sagacious men in the century were engaged in projecting and building these canals, but their expectations with regard to them were never realized."

Turning to the separate records of the different States, one of the most important enterprises in the country at the date of its construction was the Erie Canal, connecting the great lakes at Buffalo with the seaboard at New York, via the Hudson River. Built as a Government work the canal was completed in 1825, but large sums have since been expended upon it from time to time, raising its total cost to the State to $51,600,000. A history of this undertaking and its disappointing results was given recently in the pages of the *Railway News*. After the construction of railways to Buffalo great inducements were held out to shippers of produce to use the canal in preference to the newer mode of transport, but it was found the business could not be diverted from the railways. Old and useless branches of the canal were abandoned, and the tolls were reduced from time to time, until the rate was finally fixed as low as one cent per bushel for the carriage of grain. In 1882 the State Constitution was amended, and all tolls were abolished, though without appreciable growth of traffic resulting. The returns for the last year of working under the old constitution gave a total cost of the 607 miles of $68,229,416; the gross income was $1,239,448; the expenditures $1,099,974; the net income being less than one-fifth of one per cent. upon the capital cost. Of the minor canals in the State most have been abandoned from want of traffic or failure of water supply. The only case of continued and profitable working is afforded by the Delaware & Hudson Company, whose canal property has been made gradually subservient to large coal interests and many hundred miles of railroads.

The same association with railroad property has saved the existence and secured a certain amount of usefulness to the chief canal in the neighboring State of New Jersey, the Delaware & Raritan Canal, which, amalgamated with the Camden & Amboy Railroad, is operated as the United New Jersey Division of the great Pennsylvania Railroad system. So far from being able to compete with railroads as means of transportation, it is only as auxiliaries that these old-fashioned lines of communication retain much show of vitality as profitable enterprises.

The State of Pennsylvania early in its history devoted much attention to the perfection of a canal system uniting the large river which traverse the country. With the discovery and development of the vast coal deposits of the State, a fresh impetus was given to canal construction, but all the advantages of Government aid, and an abundance of the kind of traffic most suited for water carriage, could not avail to maintain profits long when once railroad building had been commenced. It was in connection with outlays on canal property that the State was led into the bankruptcy and *quasi* reputation upon which Sydney Smith delivered his well-known phillipics. The alarming increase of the State debt, the enormous excess in the cost of completing many of the works above the estimates of the engineers, and the failure in many cases of the finished lines to pay expenses and repairs, became subjects of serious consideration, and a change of policy was demanded by public opinion. The work on some of the lines was suspended, and finally, in 1840, the State finances were in such a condition that the further prosecution of the public works was suspended. Such canals as were not permanently abandoned were disposed of to the different railways or other private companies at a heavy loss. It is calculated that some $6,000,000 was expended on abandoned works, while the difference between net earnings and interest paid during the period of State ownership was not less than $30,000,000. The expenditure exceeded $70,000,000, while the State realized scarcely one-sixth of that sum in the disposal of its interests. The Pennsylvania Railroad acquired the chief portion of the State canals. One of the divisions, however, fell into the control of the Lehigh Coal Company, and is now operated in connection with its lines of railroad.

A similar, if not so disastrous a history attended the Pennsylvania canals constructed by private enterprise, All those not worked immediately in connection with coal properties have been frequently and seriously embarrassed, passing into the hands of the mortgage creditors. Of the solvent and more or less prosperous undertakings, the Lehigh Coal & Navigation Company above mentioned controls large railway interests, and its lines are now leased to the New Jersey Central Company, itself under lease to the Philadelphia & Reading Railroad Company. The Schuylkill Navigation Company, at one time a very powerful and prosperous corporation, illustrates very forcibly the "manifest destiny" of canals. The company was incorporated in 1815, and was for many years the most successful of the many water routes, tapping the anthracite coal regions of Pennsylvania. Prosperity, however, was not reached until after 1830, when active development of coal production commenced. From that year, owing to the rapid increase of tonnage and the absence of competition, handsome dividends were paid, and the price of the stock rose to three and a half times its nominal value. As soon, however, as the Philadelphia & Reading Railroad was constructed to Port Richmond in 1842, opening direct connection with the coal regions, the canal was exposed to active rivalry. The unequal contest was only prolonged by the Schuylkill Company securing control of some tributary lines of railroad; but, after more than one period of bankruptcy, the canal passed into the hands of the Reading Company in 1880. The Susquehanna & Tide Water Canal several years previously had shared the same fate, but the receipts have continued to decline under the management of the new owners.

Among the other canals of the Eastern States the most valuable is the Chesapeake & Ohio, a work commenced shortly after the Declaration of Independence. The project was, however, only carried to completion in 1850, and great results were expected from the communication opened between the Potomac and the head waters of the Ohio River. The canal, though nominally worked by a joint-stock company, is really owned by the State of Mary-

land by virtue of mortgage loans of $6,375,000. Besides this there are other funded debts approaching $2,000,000, while the actual accumulation of debts in the past (including interest and State claims) are estimated at $20,000,000. No interest has been paid on the bonds held by the public since 1864.

The State of Ohio has been especially unfortunate in its experience of canals. The present mileage is given as 674, constructed at a cost of over $25,000,000, but 205 miles have been abandoned, costing over $3,000,000. The State Canals, previously worked at an annual loss, were in 1861 leased to a corporation for a period of ten years for an annual rental of $20,775. They were leased again in 1871 for another period of ten years, but in 1877 the canals were surrendered, because of the State having allowed the destruction of the basin at Hamilton, Ohio. A receiver was appointed when the company surrendered the canals and he worked them for a year at a loss. The Board of Public Works then took charge of them, and by the latest account the expenses of the department were about covered by the receipts.

Almost the sole exception in the United States to the dismal record of loss and disappointment which has followed canal construction, is to be found in the case of the St. Mary Falls Ship Canal in Michigan. This work is a short link of about a mile in length, which permits of the passage between Lakes Huron and Superior, avoiding the Falls of St. Mary. It can, however, hardly be contended that this is an instance of profitable canal enterprise, since it is a mere completion of an unrivaled chain of natural inland navigation. The work, moreover, has been almost from the first a State undertaking. For twenty-five years the State of Michigan conducted the business of the canal, charging the vessels only such tolls as would pay the operating expenses and repairs, the great aim being to make the tolls as light a burden as possible. The United States offered to take the canal and manage it free of tolls. The State of Michigan accepted the proposition, and the transfer was effected in 1880.

The following figures are taken from the official records of the year 1880, latest complete returns made to the State Department at Washington of the results of working the canals which have not been abandoned:—

State.	Mileage.	Cost.	Gross Income.	Expenses.
New York	608	$68,229,416	$1,239,448	$1,099,974
New Jersey	171	10,776,353	635,108	461,762
Pennsylvania	529	37,706,645	1,562,018	586,024
Delaware	14	3,730,230	201,783	62,245
Maryland	104	11,290,327	372,616	227,277
Virginia	44	4,042,363	104,048	71,632
North Carolina	13	300,000	8,000	3,000
Georgia	25	1,907,818	8,200	14,362
Florida	10	70,000	Not returned.	
Louisiana	19	2,030,000	27,840	13,650
Texas	8	340,000	4,535	3,454
Illinois	102	6,557,681	107,605	125,601
Michigan	3	7,425,300	52,519	28,532
Ohio	674	15,022,503	214,891	223,643
Oregon	¾	600,000	Not returned.	
Total for U. S.	2,515	$170,028,636	$4,538,620	$2,954,156

The above figures of "cost," it will be remembered, do not by any means represent the full outlay for the construction of the various canal systems, but merely the capitalization in the hands of the existing owners, railway companies and private corporations, by whom most of the systems have been obtained at foreclosure sales or direct acquisition at enormous discount, after a period of State ownership, nor does it include the amounts advanced by the State governments or municipal bodies. With all these deductions from cost and with all the advantages of working in association, instead of in competition, with railway properties, the return on the capital, it will be seen, is considerably less than 1 per cent. With such a varied field for traffic development as presented by the United States, with all the varying circumstances of seaboard, lake, river, and inland connections, and of State, railroad, and private control, the above aggregate figures are eloquent arguments as to the insufficiency of canal accommodations for traffic, and the unremunerative character of these enterprises at the present day.—*Railway News.* (London.)

MORE ECONOMY OF OPERATION NEEDED.

THE attention which has been called to railway rates and operation through the daily press, and the action of the railway commissioners of several States, cannot fail of having some good results as far as both the railways themselves and the public are concerned. The result of investigation into the details and methods of any business, even though the spirit which prompted such investigation be a hostile one, nearly always directs attention to certain points in which improvements can be made in conducting business. In the investigation which took place in Illinois a short time ago the closest examination sufficed to show that the numerous claims of extortion and discrimination which had been urged rested upon very slight ground, and it was found that the charges brought forward were either a perversion of the true facts of the case or were founded entirely upon misunderstanding of the situation.

Viewed from the railroad standpoint, however, the results of the conferences and inquiries referred to have been largely beneficial to the roads, even though the motives which led to such investigations were unfriendly ones. An advantage has been gained from a full ventilation of the fact that the rules which govern railway charges between various points are mainly formulated from the same principles which hold in other classes of business. This view of the case has been virtually conceded by the majority of those who presented evidence which they considered condemnatory of western railroad management.

Such approximate operating returns for the past year as we have been able to obtain in relation to various roads, show that, while there has been generally a decrease in gross earnings, there has also been a noticeable decrease in operating expenses. The decrease in expenses, however, is not usually equal to that in earnings, thus sustaining the position we have so often taken in the past, that it is almost impossible to reduce expenses as rapidly as the sudden declines which so often affect the volume of traffic and earnings. The result of such difference in the ratios of decrease in earnings may have such an effect that the highest cost for doing a certain amount of business can come in the season of smallest traffic. Though there has been a material reduction in the price of some classes of supplies, notably in the case of steel rails, yet it is clearly proved that the sum saved through such reduced purchase figures is not equal to the increased proportional expense of doing business, caused by lighter traffic. The result of the year's working, therefore, will doubtless show a higher cost per ton per mile than held in 1883.

This view of the case will by no means bear out the assumption of numerous persons that, in view of the low price of farm products and other freight, there should be a material reduction in railroad rates—the fact being that low prices in freight can be accompanied by comparatively high cost of transportation.

The second week of the new year, however, seems to indicate more promise, and not only is a new feeling setting in as regards prices of farm products, thus inducing a larger amount of railroad shipment, but there is also consequently a better demand for railway securities. There seems also an awakening to some extent among various manufacturing industries, and the papers are full of notices of firms which have resumed operations to a greater or less proportion of their capacity.

The coming year bids fair to see an increase in the work of railway building over last year's figures The low prices of railway material and comparatively low rates of labor, afford an opportunity which may not again happen for several years for the older lines to make, at a low cost, renewals and betterments to their roads already in operation, or extension of their branches into such territory as may seem profitable.

There are also reports of more or less new enterprises, a number of which are comparatively important lines, traversing sections of country needing better rail facilities and which will probably afford adequate revenue to the first roads running through them. There is also the usual number of visionary lines which will probably never assume more than a paper existence. There is also, we are sorry to say, some indication of the renewal of attempts to build new lines through territory already over-supplied, or to construct such lines parallel to existing roads. This building of lines not needed may be done by persons who have a false idea of the cost of building and operating railroads, or who wish to absorb the surplus wealth of a confiding public by so doing. In some cases the conception and construction of such lines is due to a desire to blackmail to a certain extent lines already in operation, in hopes of a profitable sale of their properties to them when finished.

In regard to all schemes of new lines, except in cases where the needs of the country absolutely seem to demand increased railroad facilities, it would be well to exercise caution. The outcome of so many lines built in the past under such conditions has been most disastrous both to the roads themselves and to those owning their securities. The present list of roads in hands of receivers strongly exemplifies this fact.

The testimony taken before the Illinois railroad commissioners showed that the receipts per ton per mile were lower in 1884 than in 1883, and that figure in turn was less than rates received in 1882. Even with a return of better times there is no probability of anything like a material increase of rates; any future increase of earnings will probably be dependent upon a larger volume of traffic. Neither is there much prospect of any material reduction in cost of operating expenses, though a large volume of business naturally decreases the cost per ton or per passenger per mile by reason of the larger traffic figures over which the items of fixed expense are to be spread.

In a former number we have stated that the proportion of operating expenses of our roads in general, in which there seemed a chance of any material economy in the future by improvement of methods, was not over 20 per cent. As only a portion of this percentage could be saved by any such improvements, it seems that the possible gain through any radical methods is very small. In addition to this limitation we have also to consider the many items which tend to increase the cost of transportation. The increasing competition between different lines has induced on all sides greater concessions to the patrons of the road. The freight shippers have their merchandise now carried in trains which make nearly passenger speed, and to effect this in some instances the cars are supplied with air-brakes, thus adding materially to their expense, together with the increased cost of running such heavy trains at high speed. Passengers have more facilities offered them for the same money, and the amount spent in running extra chair, sleeping and dining-cars is large. The methods of advertising and canvassing territory is very expensive, and the practical value of some of these outlays seems decidedly questionable. The evil having once crept in, it is hard for any road to take a backward step in the matter.

These points will emphasize further the necessity of the utmost economy in railway operation in the future. The period has undoubtedly been reached when the road that pays anything like a reasonable return upon a capitalization not exceeding the present cost of the property, except in times of universal prosperity, is the exception and not the rule. This state of affairs was, as far as concerns Illinois roads, clearly set forth in the statement just published by the State railroad commissioners.

Any surplus of net earnings being therefore an uncertain quantity, it is desirable that in prosperous years some provision be made, if possible, for tiding over a more disadvantageous season. It has been too much the custom on the part of shareholders to call for a full division of profits among those holding the shares for the time being. This, as has been often said arises from the fact that so much stock is but temporarily held for speculative purposes. An action on the part of regular investors to patronize only the dividend-paying stocks of roads whose managers have acted in a conservative manner in this respect, might perhaps have a wholesome effect in the future. To sum up these remarks, we would say that while the immediate future seems to present some features of hopefulness over the situation last year, yet the closest economy and watchfulness must still be exercised if successful railroad operation is to be the end reached.—*Railway Review.*

RAILWAYS IN OUR COLLEGES.

THE following discussion of railway problems has been added to the curriculum of Yale College for the current academic year, to be conducted under the supervision of Mr. Arthur T. Hadley:

RAILROADS: THEIR HISTORY, THEIR BUSINESS METHODS AND THE SOCIAL PROBLEMS CONNECTED WITH THEM.

Introduction.—The questions involved, and the methods of studying them.

I. *History of the Transportation System of the United States:*

1. Roads and waterways; especially (*a*) the Erie canal and (*b*) the Mississippi river

2. History of railroad extension.

3. Railroad consolidation down to 1872.

4. Fast-freight lines, etc.

5. Railroad pools formed previous to 1877; especially (*a*) the Missouri River pools and (*b*) the Southern Railway and Steamship Association.

6. Trunk-line contests down to 1877; with accounts of (*a*) the "Evener" system, and (*b*) the Standard Oil contract.

7. The Trunk-line pool and the Joint Executive committee; the trunk-line contests of the last seven years.

8. The condition of the railroad system to-day.

II. *Railroad Business Methods and their Effects upon the Community,*

1. Special characteristics of railroad business.

2. Railroad accounts; with especial reference to (*a*) the difference between the accounts of railroads and those of other lines of business; and (*b*) the questions involved in separating maintenance from construction account.

3. Railroad reports and statistics.

4. Railroad expenses, with special reference to the distinction between fixed charges and other elements of expense.

5. Railroad rates. (*a*) Actual practice of the railroads in making rates. Classification. Through and local rates. Special contracts. (*b*) Popular criticisms. (*c*) The attempt to base rates upon cost of service is wrong. (*d*) The principle of charging what the traffic will bear is right in itself, but liable to abuse. (*e*) Discrimination, right and wrong.

6. The reduction in rates during the last fifteen years, how effected. How cost of service becomes an element in charges based upon what the traffic will bear.

7. Competitive rates (*a*) against water routes, (*b*) in railroad wars.

8. The pooling system, in railroads and elsewhere. Its causes and effects.

9. Railroad profits. Railroad investments. Railroads and commercial crises.

10. Speculative railroad building and management. (*a*) Parallel railroad. (*b*) Construction companies. (*c*) Other subsidiary corporations. (*d*) Conflict of interest between owners and management; (*e*) Between stock and bonds. Receivership.

III. *Foreign Railroads and Railroad Legislatiion:*

1. England (*a*) railway management and legislation down to 1872. (*b*) The railway commissioners and the investigation of 1881. (*c*) Comparison of English and American railroad service, traffic, rates, etc.

2. Continental Europe. (*a*) Summary of railroad history and legislation in Belgium, Russia, Austria, France, Italy. (*b*) The system of avoiding discrimination by extension of pooling arrangements into the fullest detail. (*c*) Continental traffic and rates compared with those of England and America.

3. General information on the development and character of the railroads of the world.

4. Comparison of state and private ownership.

IV. *Railroad Legislation in the United States:*

1. Brief summary of miscellaneous points. (*a*) Special charters *vs.* general railroad law. (*b*) Limitation of dividend. (*c*) Systems of taxation. (*d*) Liability on bills of lading or for performance of duty as carrier. (*e*) Accidents.

2. Subsidies. (*a*) Land grants. (*b*) Municipal subscriptions, etc.

3. The granger movement.

4. State railroad commissions and State control of rates. (*a*) Pro rata and short-haul bills. (*b*) Commissions with active powers (Georgia, California, etc.). (*c*) Commissions to secure publicity (Massachusetts, etc.).

5. Proposed Congressional legislation, history of the Reagan bill and the various substitutes offered.

6. Present needs and prospects.

The instruction is mainly given by lectures, but it is intended that there shall be the freest discussion, by the whole class, of all points that are doubtful or obscure.

The following course of reading is marked out in connection with the lectures for the coming year:

Adams—Railroads, their Origin and Problems.

Farrer—The State in its Relation to Trade: Chapters VIII., X., XI., XII., XVII.

Sterne—Railroad Poolings and Discriminations.

Black—Letter to the committee of the New York Chamber of Commerce, November 16, 1880.

Letters of Messrs. Fink and J. J. White on the question of pooling.

Fink—Argument before House Committee on Commerce, January, 1884.

The students are also urged to read a number of works by Blanchard, Cooley, Atkinson and other writers bearing on the subjects discussed and referred to in the lectures, and are further requested to prepare original essays on special topics appertaining thereto. These essays are to be read before the class and made the subject of general discussion.

A WEST-BOUND freight on the B. & M. main line the other day reported at Dorchester that there was a man lying doubled up near the track some distance back, who looked as if he might have been hurled off a train and killed or made insensible.

The word was sent in and orders were sent that the east-bound passenger should stop and an examination of the matter be made. As they approached the place designated they saw the man, evidently in the same position he was in when seen by the freight-train crew. The train stopped, and the conductor and the engineer and the fireman and most of the passengers got off in a great excitement and gathered around the prostrate form.

"See how he is doubled up," said one of the passengers. "Poor fellow, that must be just the way he fell."

"Doesn't seem to be bloody," said another.

"Look, he moves," said a third, as they came up closer. "He isn't dead, anyway. Seems to be breathing all right."

"I don't believe he is much hurt," said a little man from Kansas. "Here, what's the matter? Can you hear?"

The figure raised up, and wiping his eyes with a pair of grimy fists, said: "It beats h—l if a man can't lay down and take a nap without having an excursion run out to gape at him."—*Lincoln* (Neb.) *Journal.*

"I DON'T understand how the railroads can afford to reduce the fare to one cent a mile." "Oh, it's very simple." "They have to make up the loss in some way." "They do." "How?" "Make the sleeping-car porter divide with the company."

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APACE WITH THE TIMES.

WHETHER the sanguine anticipations of the optimist are to be realized, and the year 1885 be one of renewed prosperity to all our great industries, or whether the dull season will conclude to linger with us a while before it departs, the JOURNAL will continue to be a faithful reflex of the requirements of our railways, and starting out upon its fifty-fifth year of existence, dull as the outlook of trade at present is, it can recall duller seasons and gloomier prospects.

We are content to await in patience a return of better times, and shall devote our humble efforts to quickening the return, by pursuing our paths with cheerfulness and hope. Whether the times be prosperous or dull, the AMERICAN RAILROAD JOURNAL will continue to furnish the railway world with a monthly magazine and review, and solicits contributions toward this worthy end from every person who is truly interested in railway progress. With the current number we publish four more original contributions, making the total number appearing since the change in management in June, thirty-four; and as a record of seven months' work, we honestly don't think that more could have been asked had the times been those of the most golden-hued prosperity. Upon this record we rely for judgment, and by this record we shall seek guidance for the future.

RAILWAY EDUCATION.

IN response to a number of inquiries we publish elsewhere in our columns the course of railway study introduced into the curriculum of Yale College during the present year. That the chief educational institution of the country should recognize the importance of railway interests to an extent that induces its faculty to furnish a special course of study on the subject is of itself an important fact; but that this instruction should be carried out so minutely, treating of the details of the business with such fidelity to the actual requirements of a sound railway education, is a wonderful exemplification of the vast and overshadowing proportions to which the railway industry has grown. By this one act the faculty of Yale College have elevated railway management to the dignity of a science, an elevation not only gratifying to the railways, but of incalculable benefit to the country.

It may be urged that the theoretical railway knowledge imparted by this course of study will be of little practical benefit to the students, and that the collegian crammed with this scientific study will be unable to compete in usefulness with the practical railway man whose knowledge is derived from years of experience; but with this opinion we respectfully take issue. Experience is essential in the conduct of railways, as it is in any business or profession. Responsible positions on railways are not awarded to men

simply for their knowledge, but on account of their special fitness and tried worth, and without years of experience such special capabilities cannot be determined nor measured. The railway manager risen from the ranks is a man to be respected and prized, and for such there will ever be constant demand. But it is folly to say that there is at the same time no field open for the careful student who has thoroughly and exhaustively studied the problems of railway construction and management as a science, as it is folly to say that a business man is not benefited by a thorough and liberal education. It is experience that fits one to command and education that enables him to profit rapidly by his experience. There is a liberality, a desire for improvement, an avoidance of what may be termed "ruttishness," which education alone can furnish, and when this education is in part directed in those identical fields which the student will eventually enter, great results can be anticipated. The man of experience alone pursues beaten paths, the man of education is prompted to explore, and there is no technical information which cannot be benefited by a prior theoretical education.

But to strike at the root of the matter and to state the immediate benefits that will accrue from the study of railways in the light of a science, it is easy to see that the action of the Yale authorities is more than a recognition of the importance of railways to the prosperity of the country. It is also a very clear-headed recognition of the fact that other fields must be opened to the college-bred man than the three learned professions, already overcrowded. Thousands of young men are annually graduated from American colleges, and it is the duty of their instructors to see that their education shall be of practical benefit both to themselves and to the community. A liberal education must have higher aim than self-gratification, and with the present over-supply of lawyers, clergymen and physicians, other channels of usefulness must be opened to the collegian. Many years ago the importance of this step was recognized, and the establishment of scientific and agricultural schools and departments was begun with zeal by all the large colleges. As a result, civil, mechanical and mining engineers, architects and farmers, were yearly graduated from these institutions until at present the supply is in excess of the demand, and the ingenuity of the college faculty is again taxed to discover a new field of usefulness for the graduate. Yale has recognized the field of railway construction and management as one in which a liberal education can be employed to advantage, and we think this recognition is wise and judicious.

That years may elapse before the benefits of this education become apparent in the actual service of the college graduate is possibly true, but immediate benefits will be experienced of no inconsiderable moment. The study of railways as a special branch of technical knowledge will, as we said before, elevate it to the position of a science, and such elevation will immediately be followed by a step indispensable to all sciences, and one of the distinguishing features of a science; namely, an exact terminology and classification. The facts and principles connected with railways will be collated under appropriate heads, right names will be given to the right things, and railway knowledge will be systematically arranged in concise and proper form. This alone is of the greatest benefit, and when to it is added the scientific and literary contributions that will emanate from the study of railways as a science, we can well afford to wait a few years for the practical benefits of actual railway service by the students to be realized. In the meantime it is highly probable that Yale's rivals will also enter the field in competition and to them all we say God speed! They will be doing a service to the students, to themselves, to the railways and to the country, and the inauguration of the study of railways is a further illustration of the practical benefits of our American college system, insomuch that present needs whether national or local, are quickly recognized by our higher institutions of learning. Unlike European universities, they do not confine themselves to the *has been* but also give consideration to the *to be*.

THE INTER-STATE COMMERCE BILL.

THE Inter-State Commerce bill as introduced by MR. REAGAN of Texas, has passed the House of Representatives—as might have been expected. The bill was designed as a blow at the "aggressive" power of railways, and of course none of our worthy representatives would dare face their constituents after neglecting this glorious opportunity to attack the bloated bondholder and capitalist in general.

A careful glance at the provisions of the bill will show that railways are to be prohibited from doing anything beyond running their trains, and least of all must they be allowed to make any money under any circumstances. In the kindest and most paternal manner the government intends to show our railway magnates and capitalists just how things should be done in the interests of the public, and the greed of gain on the part of those selfish individuals who have invested their capital in railways is to receive a wholesome check. They are to learn that a return for the moneys invested is no longer to be countenanced, as savoring of oppression, and the railway managers are to be restricted in their powers to an extent that will make them hold the positions of upper-class brakemen or conductors.

We are weary of comment upon the dumb-headedness of Congressmen in general, and have resolved to express

no surprise at any of the thousand and one measures of demagoguery which may be attempted in our national legislature; but we can hardly refrain from giving utterance to a feeble prayer that if Providence cannot instill a little common-sense into the average Congressman, it will at least direct his efforts in fields where he can talk much and do little. Of course, as might have been predicted, the chief supporters of the REAGAN bill came from States where railway progress is least active, and if these gentlemen can be said to be more ignorant upon one subject than another, it is upon the subject of railways. No one questions the fact that many of the supporters of the bill voted for it under a strict sense of duty and with the consciousness that their action was entirely unselfish, and this makes us feel all the sadder. Knavery, in the abstract, is less to be feared than ignorance, for it dare not work in the light. After all perhaps the great scoffer, BOB INGERSOLL, was right, when, to illustrate the fallacy of the theory of Divine Omnipotence, he asked his hearers whether in sober truth anyone believed that the Creator could impart wisdom to Congress.

Fortunately the bill has gone to the Senate, where there is every chance of its quiet demise under the weight of a decided majority in the negative, and even failing this the President may have his little say about it. We have our faith in the Senate, however, and the bill bears the marks of a short and uneventful life. Possibly the grave and reverend Senators are not much wiser or better men than their brother legislators in the other wing of the Capitol; but then they are compelled to meet their constituents but once in six years, and any little slip in the direction of common-sense may be overlooked and forgotten with the lapse of time. They talk about this being a free country! A more absurd proposition was never made. There is an autocrat in this country, more tyrannical, despotic, remorseless, and, withal, more stupid than the most barbaric of Eastern rulers, and his name is Constituent. Before him tremble all official creation, Alderman, Legislator, Governor, Congressman, nay even the President himself, and his word is law—and generally very bad law. The Constituent is the motive power of the REAGAN bill, and its defeat will be the sign for a mighty outburst of his imperial fury. We are eager for the outburst, and trust his majesty may have occasion to rage without stint.

EDITORIAL NOTES.

THE managers of the New York elevated roads have made a bold and unexpected move. Harassed by burdensome taxation in this city they have suddenly removed their offices and headquarters to the peaceful town of Irvington, thus seeking a taxation under another county, and under more moderate appraisement. This was indeed shrewd, and we shall now look to hear of the Pennsylvania road establishing its headquarters in Honolulu, and of the N. Y. Central transporting its offices to the fertile soil of Alaska. A wise man is ever ready with expedients.

* * *

IT is stated that the gross earnings from the railways of this country during the year 1882 amounted to $770,356,716, while the gross earnings of our licensed saloons in the same period amounted to $979,345,000. This fact seems to have galled some of our esteemed contemporaries, and they demand that this preponderance in favor of rum should be checked by a greater taxation of spirits and a less taxation of railways. For our part the only surprising feature of these comparative earnings is that those realized on rum are so little in excess of those realized by the railways, and we earnestly deprecate any suggestions of Congressional interference. All the legislation in the world will not persuade a man to resort to a trip upon a railway as a substitute for intoxicating drinks, and it must be recognized as an undeniable fact that the more Congress tinkers with any question the worse we are off.

* * *

CAN anyone in his sober senses believe that passengers can be transported from New York to Chicago and St. Louis, even on an emigrant train, for $1, at a profit to the carriers? Yet this is the point to which the war of rates has brought the emigrant fare between these cities on both the Pennsylvania and the West Shore. And the West Shore is in the hands of a receiver too! Why not do a thing handsomely and transport passengers free, adding a chromo or two by way of inducement.

* * *

IT is a great pity that this system of rate wars is confined to railways, and we would like to call the attention of all trades and industries to the example which the railways are offering. Conceive of the universal joy with which we would hail a war in rates between butchers and bakers and grocers! That would be something practical, and we long to see the enterprising competition now existing between railways extend into domestic channels.

* * *

WE have received the annual report of the Board of Railway Commissioners of New York State, and it is certainly a most voluminous and exhaustive work. Apart from the elevated roads, the railways of this State are stated to have carried, during the fiscal year ending September 30, 1884, one billion and three-quarters passengers over one mile, and nine million tons of freight for the same distance. This is an increase in travel of fifty-four per cent. over the year previous, but at the same time there is a decrease of earnings of nearly $8,000,000, the total earnings for the year amounting to $126,204,164, against $133,980,625 during the year previous.

Evils of Railways in 1830.

THE New York *Gazette* of September 20, 1830, gives the following humorous argument, which it says was used by a canal stockholder in opposition to railways: "He saw what would be the effect of it; that it would set the whole world a-gadding—twenty miles an hour, sir! Why, you will not be able to keep an apprentice boy at his work; every Saturday he must take a trip to Ohio to spend the Sabbath with his sweetheart. Grave, plodding citizens will be flying about like comets. All local attachments must be at an end. It will encourage flightiness of intellect. Various people will turn into the most immeasurable liars; all their conceptions will be exaggerated by the munificent notions of distance—'only a hundred miles off! Tut, nonsense, I'll step across, madam, and bring your fan.' 'Pray, sir, will you dine with me to-day, at my little box at Allegheny?' 'Why, indeed, I don't know—I shall be in town until 12. Well, I shall be there, but you must let me off in time for the theater.' And then, sir, there will be barrels of pork, and cargoes of flour and chaldrons of coals, and even lead and whisky and such like sober things, that have always been used to sober traveling, whisking away like a set of sky-rockets. It will upset all the gravity of the nation. If a couple of gentlemen have an affair of honor, they have only to steal off to the Rocky Mountains, and there no jurisdiction can touch them. And then, sir, think of flying from debt. A set of bailiffs, mounted on bombshells, would not overtake an absconded debtor—only give him a fair start. Upon the whole, sir, it is a pestilential, topsy-turvy, harum-scarum whirligig. Give me the old, solemn, straightforward, regular Dutch canal—three miles an hour for expresses, and two for jog or trot journeys—with a yoke of oxen for a heavy load! I go for beasts of burden; it is more primitive and scriptural, and suits a moral and religious people better. None of your hop-skip-and-jump whimsies for me."

Some Useful Notes for Engineers.

AMONG the questions most frequently asked of our inspectors when making their ordinary visits, says the *Locomotive*, are the following, which are of such general interest to engineers as to warrant publication:

1. How much water per pound of coal should be made into steam at 60 pounds pressure per square inch with 60 inch tubular boilers properly made, well set, and carefully fired?

Under the above conditions, from 8 to 10 pounds, dependent somewhat, of course, upon the quality of the coal and the temperature of the feed water.

2. How much more coal per pound of water does it take to carry 80 pounds per square inch than it does to carry 60 pounds per square inch?

This question could with more propriety be put as follows: How much more heat does it take to make a pound of steam at 80 pounds pressure per square inch than it does to make a pound at 60 pounds per square inch?

Practically, no more coal will be required; theoretically, about 0.4 of one per cent., or about $\frac{1}{250}$ part more.

3. Do you get enough better results from steam of 80 pounds per square inch than you do from steam 60 pounds per square inch to pay the extra wear and tear of boiler and engine?

Depends entirely upon conditions. If you can make use of steam of 80 pounds pressure, it pays to use it; there are conditions, however, where 60 pounds, or even less, would be decidedly more economical.

4. How much more heat do you get from pipes carrying 60 pounds pressure than from pipes carrying 10 pounds pressure?

Two and one-tenth per cent. more heat will be given out per pound condensed from steam of 60 pounds pressure than from steam of 10 pounds pressure, in falling from temperature due to the respective pressures of to 212° Fahr.

5. What proportion of direct heating surface to the volume of a fairly-protected room is required to maintain the temperature of the room at 60° Fahr. in buildings heated by steam?

From $\frac{1}{75}$ to $\frac{1}{250}$, according to size and exposure of room.

6. How much is a given amount of steam reduced in bulk by compressing it from 60 pounds per square inch to 80 pounds per square inch?

About 20 per cent. See any steam table.

Railway Capital in Great Britain.

ONE of the most marked features about the capital invested in railways in Great Britain, says the London *Railway News*, is the steadiness of the return to the investor, when the results of the various systems are taken in the aggregate. In no other industry would a retrospect over ten years show such slight variations as does the subjoined table, giving the average rate of dividend paid by the railway companies of the United Kingdom, from 1873 to 1883, and the proportion which the different classes of capital bear to the total. In these ten years the return to the ordinary stockholders has not varied 1 per cent., the widest fluctuation being between 4.99, in 1873, and 4.02, in 1879. So far from 1883 having been the worst which railway shareholders have experienced in the decade, there were five years in which the rate of distribution was lower than last year. This is a result which must be considered as highly encouraging, when the vast amount of new capital raised amounted to £196,000,000 for the ten years, and the loud complaints as to the dullness of trade which were even louder last year than for some time before, are considered.

	Ordinary.		Pref. & Guar.		Loans & Debs.	
	% of Cap.	Div.	% of Cap.	Div.	% of Cap.	Div.
1873..	42	4.99	32	4.48	26	4.29
1874..	41	4.49	33	4.52	26	4.28
1875..	40	4.72	34	4.54	26	4.26
1876..	40	4.52	35	4.48	25	4.26
1877..	39	4.51	35	4.47	26	4.25
1878..	38	4.32	37	4.39	25	4.23
1879..	37	4.02	38	4.39	25	4.21
1880..	37	4.72	38	4.35	25	4.22
1881..	37	4.66	38	4.29	25	4.21
1882..	37	4.73	38	4.28	25	4.21
1883..	37	4.68	38	4.26	25	4.21

A satisfactory feature of the above figures from an ordinary shareholder's point of view is the steady decline in the rates at which the new capital has been raised. In 1873 the average return on the preference capital was 4.48, but for last year the distribution represented only 4.26 per

cent. In the case of the loans and debenture stock it is also encouraging to note that the average rate of interest is now only 4.21, against 4.29 per cent. ten years ago, and that the proportion which this class bears to the total capital has declined from 26 to 25 per cent. This is due to the clearing-off of temporary or debenture loans. Several of the companies have now no debenture loans, and it is undoubtedly sound policy to avoid the contraction of temporary loans, and to substitute for them the present form of debenture stocks. With money at its present exceptionally low rates there is a strong temptation for companies to borrow temporarily rather than exercise their capital powers. There is, however, an element of danger in this course as exemplified by the experience of so many American railways, whose financiering has been successfully carried on by loans until some sharp and sudden crisis in the money market has frightened lenders, and at the same time spoilt the market which the companies previously had for their securities. In England the chances of such severe and sudden changes in the money market are more remote, but there can be no question that the smaller the amount of a company's debenture or other temporary loans, the sounder in the long run must be the state of its capital account.

Wear of Rail-bolts by Creeping of Track.

THE wear of the bolts, remarked a recent speaker on the subject, is caused by the expansion or elongation and contraction of the rails; by friction caused by the passing over them of heavily loaded trains, commonly called "creeping" by railway men; by an imperfectly constructed formation, or bed for the road; and to imperfect packing of the sleepers, which was more or less well known to all men engaged in the maintenance of permanent way. The wear of the bolts by expansion and by creeping of the rails was similar in effect, but not equal in degree of destructiveness—the creeping of a rail being a much greater destructive agency than expansion. There was creeping also attendant on expansion of the rails being due to friction from the working power of heat. The expansion of elongation of steel rail measuring twenty-four feet long and weighing 678 pounds was found, by experiments during the summer of 1881, to be 0.02 inches under a temperature reading ninety-nine degrees on a thermometer, to 0.09 inch under a temperature reading 115 degrees, the expansion or elongation of the rail being taken at two o'clock, P. M. for maximum, and eight o'clock, P. M. for minimum; the measurements were taken by means of sliding scales, of a non-expanding material, firmly fixed at each end of the rail, the scales being graduated to fifty divisions in an inch. The creeping of the rails by friction of trains was found to amount to two inches in three years. It could not be said that it continued in the same proportion year after year, but that it so continued was manifest by the constant displacement of the points and crossings and the yearly necessity of readjusting them. It was for this reason that shouldered stock-rails for points, cast-steel crossings, crossings having their point and splice rails notched, welded, riveted and fitted with distance blocks of chogs between the chair and bolted, were unsuitable and also unsafe for use on first-class railways; it was for the same reason that joint-chairs of any description were equally objectionable. The expansion of the rails was dependent on the geographical position of the permanent way; when it was laid in the direction of N. W. by E., and made a quick detour from E. to S. W., the expansion would take place in opposite directions and concentrate its force at some point in the change of direction on a line so situated; its force on the part lying N. W. by E. would be in the direction of the creeping of the rails, and on that part lying E. by S. W. in opposition to the creeping of the rails on one line, and *vice versa* on the other line of rails the point of concentration would be one of danger to the safe condition of the permanent way and the passing of trains, and in such cases required the careful attention of the permanent way inspector and foreman of plate-layers, who can always by inspection determine the locality of that point.

Locomotive Building in 1884.

ACCORDING to the *American Machinist* the year just closed has been a bad one for locomotive builders. During 1883 seven of the largest builders turned out 1,346 locomotives, while the same builders during the past year turned out only 901. There are only sixteen locomotive building shops in this country, and in these shops, as near as can be learned, the total number of locomotives built in 1884 was 1,271, about 100 of which were for exportation. The most trustworthy show that there are 29,227 locomotives of all kinds belonging to railways in North America. As the life of a locomotive is about twenty-five years, about 1,169 locomotives must be constructed every year to maintain the stock.

The large number of heavy engines built last year would indicate that they were growing in favor. A ten-wheel engine seems to be liked best on a heavy freight road. Almost every railway has its peculiar style of locomotives. The New York, Lake Erie and Western uses for freight-trains a long, low, black, ten-wheel engine, which is very powerful. The Pennsylvania road does not care so much for the number of wheels as for their size, and it has them made as large as possible.

A locomotive that is never seen in this vicinity is the camel-back engine, used for heavy work in the mountains by the Philadelphia and Reading Railroad. It is a double-end engine with a two-story cab set on top of the boiler. The engineer's seat is over the top of that of the fireman. These are heavy engines.

Sleeping-cars in England.

IT is only a comparatively short time, says the *Mechanical World*, (Eng.) since our railway companies introduced a regular service of trains having sleeping accommodation for first-class passengers, the pioneer company as usual being the Midland with their Pullman sleeping-cars on the American style. Several of the leading companies who run long journeys, notably the London & North-western, have now, however, followed suit, and as a consequence the night traffic has considerably increased, an example of which may be mentioned that took place on Sunday night, the 10th ult., at Euston station. No fewer than four trains were required to convey passengers to the north for the shooting season, by this company's sys-

tem. The first part of the 6 P. M. express had 19 vehicles, 13 of which were entirely given up to passengers requiring sleeping accommodation, in addition to several private saloon carriages. In the four trains into which the ordinary train was divided, 260 beds were made up, necessitating the marshalling of the trains at the platform two hours before starting. It is not too much to say that a considerable number of passengers now travel long distances in one day, who from the fatigue attending enforced sitting in one position so long, formerly took two, thus saving a day's time and hotel expenses. The London & Northwestern Company for some reason do not use bogie carriage-stock, but have adopted a system answering a similar purpose by connecting two or more six-wheel carriages together by means of passages or gangways placed at the ends and covered in by canvas and leather hoods, so arranged as to slide in or out with the play of the buffers. These carriages are fitted up in a very luxurious and comfortable manner and provided with all necessary conveniences. But still the bulk of the traveling public are unable from its expense to avail themselves of the benefits of these carriages. What is required is that some attention be now paid to the requirements of third-class passengers who are after all the chief paying portion of railway travelers. Third-class sleeping-cars (for which an extra fee in proportion to the difference in fares might be charged) are much wanted, having plain accommodation. The accommodation could take the form of sofa berths, upon which the passenger without undressing could sleep comfortably, the company providing rugs if required. Many who cannot afford the cost of first-class traveling would gladly avail themselves of such accommodation, and we have little doubt it would pay the companies to specially construct sleeping-carriages for third-class passengers.

Railroading Under Difficulties.

THE following official notice is posted in the Siamese railway stations: "The minister of posts and telegraphs hereby informs the public that the British India government has given notice to the effect that their portion of the line between Bangkok and Tavoy will be closed during the next rainy season on account of the extreme mortality among their officials. The Siamese portion of this line being, however, in the same good condition as before, will be kept open for public use between Bangkok and Pong Sakee, the boundary near the border of the British Burman territory, without interruption, during the time the British portion is closed. Notice will be given whenever the British India telegraph administration will be in a position to reopen their portion of this line."

Railways in Switzerland.

ACCORDING to the report of the Department of Public Works of Switzerland, there are 19 railway corporations in Switzerland, operating 2,883 kilometers (1,792 miles) of road. The gross earnings for the year amounted to 77,070,254 francs ($14,874,559). The operation cost 40,062,450 francs ($7,732,052.85). This was an average of 51.98 per cent. of the gross revenue. The cheapest operated line was the Wadensweil-Einsiedeln which only cost 43.68 per cent. of the total earnings, but there are seven roads which cost over 100 per cent. to operate, one of which reached the enormous sum of 166.44 per cent. There was in use on all the roads at the end of the year 615 locomotives, 1,786 passengar cars and 8,972 freight cars. There were transported 24,047,487 passengers and 7,087,990 tons of freight during the year. Of this total 1,056,043 passengers and 469,711 tons of freight were carried by the St. Gothard Tunnel Railroad, which earned a total of 11,603,536 francs ($2,239,482.43). This road was operated for 45.27 per cent. of the gross earnings and 2.14 per cent. was paid on its capital. Its length is 266 kilometers (166 miles). A total of 81 locomotives, 172 passenger and 705 freight-cars are in use on the St. Gothard Tunnel Railroad.

Primitive Railroading.

THE editor of the *Ponca*, (Neb.,) *Journal* tells how they used to travel on the narrow-gauge railway between Sioux City and Ponca a few years ago. He says: "The narrow-gauge went up and down hill, so much so that when climbing the grade near the summit the shrieking, struggling little engine found it difficult to make headway. In those days the genial conductor always regarded the few passengers as guests and treated them accordingly, and when the train went up hill, and the engine gave a howl of despair, would get off and push behind. These were the halcyon days of railroading. We recollect going down from Ponca to Jackson one day. We were the only passenger—frequently the train had no passenger at all. Below the summit we saw a man in the field plowing. He owed us on subscription. Being short of bankable funds we desired to hold a short *seance* with him, We stated our desire to the conductor. Did he turn a deaf ear to us and whip up the train? No. He jerked the cord and stopped the train and we went and dunned the man. During our absence the conductor went to the creek and fished. Those were the pastoral, the joyful, the inimitable days of railroading. The like we shall never see again."

Praising the Engineers.

THE Delaware, Lackawanna & Western Railroad is reported to have had the least number of accidents during the year 1884 of any road of comparative length in the State of New Jersey, in consequence of which, on New Year's Day, Superintendent Reasoner caused to be sent to each engineer a letter, in which, after wishing them a Happy New Year, he praised them for their carefulness, and earnestly hoped that, if possible, they would do still better this year.

Railway Taxation in New Jersey.

THE New Jersey State Board of Assessors have filed their first annual report with the Governor. It states that there are ninety-four distinct railways in New Jersey in active operation. Twenty-six are under the control and management of the Philadelphia and Reading Railroad, twenty-four under the Pennsylvania Railroad, ten under the New York, Lake Erie and Western, six under the Delaware, Lackawanna and Western, and twenty-eight are managed within themselves, outside of any system. The

following shows the amount of taxes paid by each railway system, and also by the railways managed by themselves, taken as a whole, under the new law, for last year:

	Total State Tax.	Total Local Tax.	Total Tax.
Pennsylvania Railroad system	$291,425 58	$92,213 31	$383,638 89
Philadelphia & Reading Railroad system	264,081 24	91,044 71	355,125 95
New York, Lake Erie and Western Railroad system	74,784 29	58,241 03	133,025 32
Delaware, Lackawanna and Western Railroad system	174,870 05	67,153 34	242,023 39
Railroads managed by themselves	172,467 60	79,871 11	252,338 71
Totals	$977,628 76	$388,523 50	$1,366,152 26

Canadian Railway Progress.

JOHN NORQUAY, premier of Manitoba, said in an interview at St. Paul, that the policy of the Dominion government will be liberal to railroads which will tend to develop the resources of the country. In the matter of land grants, which has been a vexed question, the old narrow policy will be cast aside, and the roads treated generously. Manitobians generally are well satisfied now that the government intends to be watchful of the interests of the province. Good results are already apparent, as a number of new railways are in process of organization, some of which will probably be begun in the Spring. Before many years Manitoba will have a complete railway system. In regard to the Canadian Pacific, work is advancing rapidly through the heart of the Rocky mountains, and in the coming year the line will be completed from Winnipeg to Port Mundy. Within two years it is expected to have a through line from the Pacific coast to Montreal.

Coal Production.

THE Cumberland district has shown greater production than ever before, aggregating the past year 2,850,000 tons, about 350,000 tons increase over 1883. According to the Baltimore *Journal of Commerce*, from which these figures are taken, there was no interruption of the working of the mines during the year. The transportation to tidewater was chiefly per the Baltimore and Ohio Railroad, which brought to that city 2,150,000 tons, an increase over the previous year of 753,000 tons. The Chesapeake and Ohio Canal carried to the District of Columbia about 350,000 tons, only one-half of the quantity carried in 1883. The Pennsylvania Railroad also shows decreased shipments of Cumberland compared with 1883 of near seventy thousand tons. Beside the Cumberland brought to Baltimore by the Baltimore and Ohio road, there were 319,405 tons of gas coal from West Virginia, making the aggregate quantity of coal brought to Baltimore by that road 2,472,495 tons, an increase compared with 1883 of 875,000 tons. The Western Maryland Railroad brought from Williamsport 23,158 tons. Of anthracite and bituminous coal received there via the Northern Central road, there is also shown an increase over 1883; the quantity brought was 767,381 tons against 693,494 tons last year. There were exported foreign during the year 59,289 tons, against 63,526 tons in 1883.

The total amount of anthracite coal sent to market for the week ending December 27, as reported by the several carrying companies, was 69,695 tons compared with 396,032 tons in the corresponding week last year, a decrease of 323,337 tons. The total amount of anthracite mined thus far in the year 1884 is 29,982,157 tons, compared with 31,547,097 tons for the same period last year, a decrease of 1,564,940 tons.

The Pennsylvania Railroad reports that the quantity of coal and coke carried over its lines for the week ending Dec. 27, was 195,573 tons, of which 156,030 tons were coal and 39,543 tons coke. Of this weekly tonnage 147,557 tons originated on the main line of the Pennsylvania Railroad, while the remainder originated on its branch lines. The total tonnage for the year thus far has been 13,142,598 tons, of which 10,326,388 tons were coal and 2,816,210 coke. These figures embrace all the coal and coke carried over the road, East and West.

The Reading Railroad reports that its coal shipment for the week ending January 3, was 184,000 tons, of which 15,500 tons were sent to and 12,300 tons shipped from Port Richmond, and 34,000 tons were sent to and 27,000 tons shipped from Elizabethport. Vessels are reported scarce at Port Richmond, and freights are quoted at $1.10@1.25 to Boston, and $1@1.10 to Providence. There is some coal shipped from the ports in New York harbor, with freights quoted at 90c@$1 to Boston.

Fictitious Dividends Rebuked.

THE managers of a joint-stock company in France were recently prosecuted criminally, charged with declaring a fictitious dividend. A law of France passed in 1867, as also a law of Belgium passed in 1873, provides punishment for paying dividends made without taking an inventory, or based on a fraudulent inventory. In the case in question a company was formed with a capital of 500,000 francs, authorized to increase this capital to 10,000,000 francs. By successive issues the capital was actually raised to 5,000,000 within five months, but between the two issues dividends were declared. Complaint was made that the dividends were fictitious. The court soon decided that there were no profits that could be divided legitimately, and then it took up the question of the "good faith" of the directors, whether they were not themselves misinformed or mistaken as to the position of the company. The court found that the accounts accessible to the directors were sufficient to make them understand the true condition of the company, and that it was not reasonable to suppose that they did not understand it. The court thereupon found the directors guilty and sentenced them to imprisonment.

A GENTLEMAN of large experience in the manufacture of pig-iron has just concluded an investigation for a number of pig-iron manufacturers in the interior of Pennsylvania, of the advantage that blast-furnaces located at tidewater have over those inland. This gentleman states that a furnace at tidewater contiguous to New York harbor can save $4.09 in making a ton of pig-iron, as compared with a furnace in the interior of Pennsylvania.

AN event unparalleled in the history of railroading occurred on the Missouri road, between Lincoln and Denver. A train of eight cars loaded with coal was blown a hundred miles by a tornado, the speed much of the way exceeding a mile a minute. They were overtaken at last by an engine, which coupled on and hauled them back.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

COUPON TICKETS ON STREET-RAILWAYS.

AS a general rule it may be stated that street-railway fares are collected on a cash basis, and that the sale of tickets, either singly or in quantities, is not actively practiced by companies. Especially is this true in large cities where the rate of fare is generally five cents, and thus collected in the majority of cases without the necessity of making change. The simplicity of the cash system with the safeguards afforded against dishonesty by the many ingenious fare registers and bell-punches, has much to recommend it; but on the other hand there are advantages to be derived from the sale of tickets in the form of coupons, and at slightly reduced rates.

Against such reduction it may be urged that the street-railways in cities are patronized by persons riding to and from their places of business, and as they must travel in the street-cars under any circumstances, such reduction would result in a decrease in revenue without any adequate benefits derived therefrom. Such it must be admitted would be the case if these passengers were the only patrons of street-railways, which is not the case. At the most, two or three hours in the morning and evening are the only periods when such patrons may be expected, and the remaining hours of the eighteen which may be said to constitute the daily period of street-railway operation produce a different class of travelers. Possibly the morning and evening business travel constitutes the chief revenue-producing patronage of a road, but the transient and "shopping" passenger is a person of considerable importance, without whom no road could be run with profit, and it is with this individual that the coupon ticket would find a ready sale. Assuming the ordinary fare to be five cents, it is for a company to consider whether the sale of twenty-five tickets for one dollar or twelve tickets for fifty cents would be a profitable venture. In most cases we think it would; the slight curtailment of revenue experienced from the daily traveler being more than met by the increased revenue from the transient. Possession is a great incentive to use, and the ordinary individual furnished with a coupon ticket entitling him to a number of trips upon a convenient street-railway would patronize that road with considerable persistency until his coupons were exhausted, when he would immediately invest in another goodly quantity. It is highly probable that he would ride two or three times under these circumstances, where he would ride but once if an actual transfer of cash were necessary on each occasion; for though five cents is but a small sum it is frequently held to be worthy of saving when a trifling walk will relieve the necessity for its expenditure. With coupon tickets these motives for economy do not obtain, and inconsequent as it may appear, the public are willing to expend ten cents in tickets where they would be loth to spend five in actual cash.

Such tickets could easily be rendered non-transferable either by requiring them to be attached to a general ticket, or by modifying them after the manner of railway commutation tickets, bearing the name of the purchaser, and punched by the conductor until the whole number of trips had been taken. Further incentive to their frequent use could be furnished in rendering them valid only for a certain number of days after purchase, thus prompting the possessor to use them lavishly for fear the period of their validity would expire before he has obtained the full number of trips; and the ingenuity of street-railway officials could meet with profitable exercise in devising further methods for increasing the patronage of their roads by means of coupon tickets sold at reduced rates. It would appear that the advisability of issuing such tickets has never been considered with the attention that it warrants, and it is quite possible that the experiment might prove a most profitable venture. If, on the other hand, it did not meet with satisfaction, the practice could be readily discontinued. Viewed in this practical light it would at least seem worthy of a thorough trial.

THE direful need of cross-town roads in lower New York City has at last received attention, and schemes are on foot to construct two street-railways of this description, one extending from the foot of Liberty street on the West side to the foot of Fulton street on the East, connecting the Communipaw and Fulton ferries; and the other extending from the foot of Chambers street on the West side to the foot of Grand street on the East, connecting the Pavonia and Grand street ferries. Such roads would be of incalculable benefit provided they could cross Broadway without hindrance to travel, but this provision will probably be a serious obstacle in the way of their construction. The off-hand generosity with which the New York Board of Aldermen conferred street-railway franchises last year has not been forgotten, and the obstreperous "property-owner" of whom we spoke last month is alert and watchful of his "rights."

OUR worthy Mayor, Mr. GRACE, has set his foot most squarely down upon measures appertaining to the wholesale gift of city railway franchises, and has issued a ringing communication to the Aldermen on the subject. It is not likely that many franchises will be conferred for some months to come, unless the city has a fair share of the profits or a round sum for the privileges conferred, against which we have nothing to say, provided the one be not too fair nor the other too round.

* * *

IT is a great pity that the recent street-railway convention was not favored with twice or thrice the number of reports of special committees that were presented, for in publishing the last installment in the December JOURNAL we sensibly appreciated our future difficulty in obtaining as valuable matter for this department as these reports furnished. Take them all in all it is doubtful if in the whole history of street-railway progress so valuable a contribution has been made to its current literature as the seven interesting reports that we have published.

THE LIGHTING OF STREET-CARS.

BY F. MARTIN GAYLER.

[Written for the AMERICAN RAILROAD JOURNAL.]

UPON reading a contribution from a "Retired Official" in the December JOURNAL, on the subject of street-car heating, I was struck by a suggestion he made therein as to the feasibility of each car being provided with a gasometer to furnish gas for a small stove that could effectually heat the car. The suggestion appears to me excellent, and the not unnatural sequence of ideas presented itself that these gasometers could also be utilized for the purpose of furnishing the illuminating power, whence the subject of street-car lighting in general comes up for consideration. When it is considered that the street-railways of this country furnish in many instances the only conveyances for daily travel to and from adjacent points, and that they are patronized daily by hundreds of thousands of passengers, there is no minor detail in their management that is not of sufficient importance to be extensively discussed; which fact was very sensibly recognized by the American Street-Railway Association, when that body appointed a special committee to consider the subject of lighting, heating and the care of cars, and to submit a report thereon. Unfortunately this report was not submitted at the recent convention, or the street-railway world would have been favored with some very useful information on the matter. Certainly a little discussion on the lighting of street-cars would be a wise expenditure of time.

I do not think I am doing street-railway managers an injustice when I say that they have devoted very little of their time and energy to the consideration of the question of street-car lighting, nor is this neglect so very surprising. As a general thing the trip of a street-car passenger lasts but a few minutes, and he is not supposed to be very particular as to the conveniences for his comfort which the companies furnish for that brief space of time. So long as a car is clean, moderately warm and attended by polite and civil employés, the passenger is not inclined to grumble, nor should he, in truth, expect "everything for five cents." Nevertheless the expenditure of a very little trouble and money on the part of the companies would result in a considerable increase of comfort to the passenger, and in the matter of lighting we are furnished with an example of the small details towards the improvement of which the companies could direct their attention with practical benefit.

Oil-lamps are relics of a bye-gone period, and there are few conveyances, apart from street-cars and omnibuses which use them at the present day. If their use is prompted through motives of economy, such economy would seem misdirected, for though in actual money the outlay for this method of lighting may be comparatively small, the constant attention required to trim, clean and fill the lamps is considerable, and could be entirely dispensed with in the use of gas. The cost of gas to the companies, for the purposes of illumination, as stated by the "Retired Official," would not exceed a few cents per car for each hour of service, and it may safely be said that one passenger's fare would cover the expenses of a car's illumination for two or three hours. Two six-foot burners would illuminate a car efficiently, and it is easy to comprehend that the cost of such illumination for six hours would not exceed fifteen or twenty cents at the outside, and probably could be reduced still lower. With the constant improvements in the systems of electric lighting, it is very probable that a few years will see each street-car furnishing its own incandescent light, the electricity being derived from small dynamos attached to car-axles, but until this desirable period has arrived it would seem in order for gas to be utilized on street-railways as it is in Pullman coaches, and even on the ordinary passenger-cars of local trains.

A sufficiency of light in a street-car would enable the passenger to read his evening paper on his return from business during the short Winter afternoons, and such a privilege would in some instances result in an increased patronage. Certainly it would in New York City, where the crowded condition of the cars on the elevated roads might frequently induce a passenger to patronize a surface road if he could economize his time while journeying. Such literary pursuits cannot be pursued with comfort when the illumination proceeds from a couple of dingy lamps attached under the eaves of the car-roof, being also made to do double duty in sending rays of light through glass lenses for the purpose of indicating the route of the car to the outside world. Injury to the eye-sight and often to the equability of the passenger's temper is generally the result of the effort made in the face of such discouraging surroundings.

If, however, oil-lamps are to remain as the sources of street-car illumination—and it is quite possible that satisfactory reason may be advanced against their abrogation—there is no reason why they cannot be placed to more advantage than is commonly the case. An argand lamp hung in the center of the car and provided with a powerful reflector, furnishes an admirable light, and can be seen in many of the street-cars in New York. Smaller lamps could be attached to the ends of the cars behind the lenses, and a considerable increase of comfort to the pas-

senger would result. It is not so much the oil-lamp itself which meets with disapproval, as the manner in which it is used, and a central roof-lamp would in many respects answer the purposes satisfactorily. It is true that such lamps would require infinitely more attention than gas-burners, but this question is one appertaining strictly to the management of the road, and is not for the passenger to consider.

Street-car lighting may rank second in importance to street-car heating among the problems of management, but it possesses one important feature in that it is a question for *perpetual* consideration. Street-cars require heating but four or five months out of the twelve, but they require lighting nightly, and for that reason the question of lighting is not to be dropped at intervals as is that of heating whenever Winter is over. There is little about it that is intricate, and more common sense than ingenuity is required in its perfection. The question may be resolved into two queries; first: shall oil-lamps be used for the purposes of street-car lighting? and second: if so, how can they be best and most advantageously placed? should the first query be answered in the negative, then other questions may come up for consideration, but as it seems up to the present time to have met with a pretty general affirmative answer, the only debate in order at present, is relative to the proper arrangement and disposition of the lamps, and without wishing to be reckoned a grumbler I think I am justified in saying that the arrangement and disposition at present in vogue can be greatly enlarged upon and improved.

RAILS FOR STREET-RAILWAYS.

WHEN street-railways were first introduced one of the most serious problems of construction was that relating to the shape of the rail. For railroads running through the country the T rail answered every purpose, and nothing for such use has been found to supersede it to this day. But it was necessary to lay such tracks in cities that ordinary vehicles, running along or across them, should meet with as little obstruction as possible. The old Philadelphia pattern of street-railway was first used for this purpose, and many tracks of this kind are still in existence. This is known as the side-bearing rail. During the last few years the center-bearing rail has come into general use. A cross-section of the latter is shaped like a straight-brimmed Derby hat, while that of the former is like a portion of the same figure cut off vertically. The wheel bears on the rounded edge of the crown of the hat, which gradually wears away; and the advantage of the center-bearing rail is that when this occurs it can be taken up and reversed so as to present a fresh rounded edge for the wheel to take hold of. This crown projects above the brim, or the level of the pavement, from one inch to one inch and a quarter.

A correspondent writes from Buffalo inquiring whether the height of this projection cannot be reduced, and says that if it were only half an inch high it would interfere less with ordinary vehicles attempting to cross the track or to turn out from it when an approaching car claims the right of way. The difficulty is that if the height were reduced the wheel of the car would not be able to grip the rail with sufficient firmness to keep its position on the track. The subject has been fully considered by those who manufacture rails, and nothing better than those in use has thus far been invented.

In New York city at present nearly all the principal railways have the center-bearing rail. The Twenty-third street railroad has such a rail, weighing 47 pounds to the yard, and the following have the same kind of rail weighing 60 pounds to the yard: Dry Dock, East Broadway and Battery; Second, Third, Sixth and Eighth Avenue railroads; Broadway and Seventh avenue; Forty-second street and Grand Street Ferry; Forty-second street, Manhattanville and St. Nicholas avenue; the Belt line and the Houston, West Street and Pavonia Ferry railroad. The most difficult street-railroad to cross is that which runs through Fourth and Madison avenues, and is continued down town through Grand, Broome and Centre streets and Park Row. On this route the T rail is used because the freight-cars of the New York Central and Hudson River and the Harlem railroads pass over it on their way to and from the freight depot in Centre street.

All the railroads in this country are now using steel rails instead of the iron rails that were formerly in use. The steel rails are now cheaper as well as better than iron rails. No iron rails are now manufactured in this country. The steel rails used here are all of American manufacture. The duty on imported steel rails is $17 a ton and ordinary American steel rails can be purchased for $29 a ton, which is just one dollar more than the duty was a year ago, before the reduction of the tariff went into effect. If there were no duty, English steel rails would cost about $2 less than the American article on account of the lower rate of wages in England. The "life" of a steel rail is from 10 to 20 years, according to the nature and amount of the traffic. The principal manufactories of steel rails in this country are in Philadelphia, Harrisburg, Pittsburgh and other iron centers of Pennsylvania. The manufacture at present in the United States is not prosperous. "I doubt," said an iron merchant to a reporter, "whether, with pig iron at $19 a ton, steel rails can be turned out at $29 a ton without the manufacturer losing money. There are about 90 rail mills in the United States. Some are idle, some are running on half time; and the industry is in a very depressed condition. The reason broadly is that the number of railroads projected and actually begun in 1879 and 1880 indicated a very heavy demand for rails, to supply which a great many new mills were started and the capacity of mills already existing was very much increased; since then railroad construction has come to a standstill and there is not the demand for rails that was expected. We have more railroads now than are needed to carry the freight, and it would be foolish to build more until these are fully occupied."—*New York Tribune.*

ELECTRIC MOTORS ON THE BROOKLYN BRIDGE AND THE ELEVATED ROADS.

THE Daft Electric Company has begun to deliver rails on the Brooklyn Bridge to be used in making experiments with an electric motor for running cars from New York to Brooklyn. The dynamos are now ready, and before Spring the company hopes to have its motors running. The experiments will be carried on at first between midnight and early morning; as soon as the motors work

smoothly, cars will be sent over the bridge during the day between the regular trains drawn by the cable. The new rails will be laid about a foot from the cable and will not interfere in any way with the present working of the railway system now in use. The electric system to be used will resemble that employed by the Daft Company on the Iron Pier at Coney Island last Summer.

The Manhattan Elevated Railroad has as yet taken no decided steps toward making the experiment of running their cars by electricity, but it is understood that Mr. Cyrus Field has the project at heart, and will probably succeed in obtaining the directors' consent to the experiment on the Second Avenue line, where traffic is least important. The companies invited to share in the expense of the experimental equipment and prove the value of their devices are those controlling the Knight-Bently system, Edison system, Field system, and Daft system. Messrs. Edison and Field some time ago agreed to pool their interests in the electric motors, and although since then there have been some legal disagreements between them they will probably act in harmony in the elevated railway experiments. Mr. Edison. as is well known, has been working at the problem of propelling cars by electricity for a number of years, and has built an experimental road nearly a mile long at Menlo Park. He abandoned his experiments when the business importance of the lamp became apparent and has not had time since to resume them. Mr. S. D. Field claims that his patent, not yet issued, but which he is confident of soon getting, after five years' litigation, covers the whole ground of electric motors, and that all the patents granted to Edison, Daft, and others can be for minor devices only. His chief contest in the Patent Office has been with the American representatives of the European inventor, Siemens, who had an electric railway in use in 1878 at the Paris Exhibition, and has since established several short lines in different parts of Europe. So far Mr. Field has been successful in upholding his claims to a patent in our Patent Office and the final decision of the Commissioner of Patents is now awaited. One of Edison's most important patents in this department covers a device by which a separate motor is attached to each car, thus making each car independent, allowing trains of any length to be made up, or single cars to be run.

A well-known expert in electrical matters, when asked as to the radical differences between electric motors, said: "There are none. The one type of motor of which all motors are copies more or less close is an ordinary dynamo machine. The so-called systems claimed by various persons differ only in details of the motor or in the methods of conveying the current from the dynamos to the motors. Some persons use one rail on the ground and a wire in the air; some use both rails; some carry it all on wires overhead. The Cleveland electric road built by the Knight-Bently Company places its wires in a trench between the tracks somewhat similar to the trench used for cable roads. A longitudinal slit allows communication to be maintained between the motor on the track and the wires in the trench. The Field patent claims the system of sending a current generated by a steam dynamo through the rails or through an auxiliary rail. If electricity should come into general use for propelling railroad-cars, there will be a very pretty crop of patent suits; several experts will have a chance to grow rich. As the matter stands now, each inventor claims for his system every protection, and questions the right of all other electricians to anything whatever.

"As to the probability of electric motors being generally used on the elevated roads within the next year or so the best judges do not expect anything of the kind. A steam locomotive on the elevated roads uses only about 25 per cent. of its steam power; from a stationary engine 90 per cent. of the steam power can be used in a dynamo. The dynamo will transmit perhaps 50 per cent. of its power to the motor, and there is therefore, an apparent saving of power. This would be all right if there was no leakage of electricity. But the leakage is tremendous, and accidents by which current is lost are too common."

Steam Power on Street-Railways.

STREET-RAILWAYS worked by steam, for the most part carrying freight as well as passengers, have become a very important part of the communication of some European countries of late years. In Italy, especially, they flourish. In Holland a recent report shows that there are in all 326 miles of street-railway in 33 different lines, 17 of which are worked exclusively and four partly by locomotives, of which there are 131 in street-railway service, besides 1,303 horses, 8 mules, 615 passenger-cars and 252 freight-cars. The average cost of the Dutch street-railways has been about $20,900 per mile. They are mostly laid with T rails, except where actually on the turnpike.

Street-Cars in Mexico.

THE street-cars are run in trains in Mexico. Instead of one car leaving the terminus every ten minutes, three cars are sent together every half-hour. This is not a measure of economy, writes a correspondent of the Chicago *Inter-Ocean*, for each car has two mules attached, and, although they are never more than half a block apart, there are always two conductors besides the driver. One conductor takes the money and gives you a ticket, and the other comes around, punches it in the presence of the passenger, and puts it in his pocket. They are supposed to be a check upon each other. The street-car drivers always carry a horn, and blow it as they approach a street crossing, so that there is a perpetual tooting going on. The conductors usually carry revolvers. I don't know why, except that it is the fashion, for a Mexican would as soon go out of doors without his hat as without his revolver.

A Street-Railway for Sale.

THE Lampasas Street-Railway, of Lampasas, Tex., is advertised for sale on Feb. 3d. This road is constructed as follows: T rail 22 and 25 lbs. to the yard, about thirty-two hundred red cedar ties to the mile, with six cars built by Messrs. Brownell & Wight, of St. Louis, Mo., last Winter, gauge of road four feet and one-half inches, (standard) total miles three and one-fifth. City franchises give right of way to all streets and alleys for fifty years, also exclusive right of way through the extensive Park grounds of the Lampasas Springs Co., extending to the grand Park Hotel and Hancock springs. The city has grown from 500 to 5,000 inside of three years, and is the county seat of Lampasas county, destined to be the Saratoga of the South.

The two springs Hancock and Hanna, are situated on the main line of the street-railway one and a half miles apart. The main street-car line is two and a half miles long, running from the Passenger and Freight Depot, via Hanna springs; court house square, principal hotels and main portion of the city, thence to the Park hotel and Hancock springs; the road is bonded for twenty thousand dollars for ten years, bonds bearing 8 per cent. interest payable semi-annually. The road can be bought at private sale between this and the third of February, on good terms, or one half interest can be bought for six thousand five hundred dollars, with four thousand dollars cash payment, balance in equal payments, twelve and eighteen months, with interest.

A New Electric Street-Railway.

SIMULTANEOUS experiments with cable railroads operated by steam power and electrical railroads naturally suggested to many inventors a combination of the two systems. The central underground tube is made to carry a fixed electrical conductor instead of a moving wire rope, and connection is made between the motor and the conductor through the slit in the tube. An electric railway on this principal has been built for experimental purposes at Manchester, England, and is said to work satisfactorily even in rainy weather. The improved contact due to moisture is supposed to make up for the loss by leakage. In this system the running rails of the road are used as return conductors. Leather straps are used to draw the connector through the tube. They serve to clear the passage way of ordinary obstructions, and if they should meet with too much resistance, would give way, breaking the connection and stopping the car before much damage was done. The straps can be easily and cheaply replaced.

A Cable Road in Lisbon.

A CABLE road has been laid in a Lisbon (Portugal) street up an incline of 1 in 4 for a distance of 560 feet. The cable is carried underground, as in our cable street roads of San Francisco and Chicago. The inclination is quite uniform, but the road makes an **S** curve. The road is worked with water, counter-balancing the weight of the car going up, but is arranged to be worked by steam in case the supply of water should be interrupted. In the first trials of the road a hemp cable was used, and, to test the automatic brakes used, this cable was cut while ascending the incline. The brakes stopped the car within a distance of ten feet. This road is the design of the Swiss engineer Riggenbach, who is well known as the designer of a mountain railroad in Switzerland.

A Street Cable Company.

THE American Cable Traction Company is the title of a new company incorporated by S. S. Battin, A. Q. Keasbey, G. G. Frelinghuysen and John H. Ballantine, of Newark, N. J., C. B. Thurston and James B. Vredenburgh, of Jersey City, Royal M. Bassett, of Birmingham, Ct., John C. Barron, of Tarrytown, N. Y., Thos. F. Stevenson, of Brooklyn, and J. Richardson, of New York, for the manufacture of cables and machinery for street-railways and the operation and control of the same. The capital stock is $100,000, divided into 1,000 shares of a par value of $100 per share; capital paid up $6,000.

Returned by a Car Conductor.

A FEW days ago, President Thurston, of the Bayonne Horse Railroad Company, of Jersey City, received the following letter:

Thomas M. Sayre, Supt. J. C. & Bergen Horse Car Co.

SIR: I herewith enclose fifty dollars ($50) which you will turn into the treasury of the J. C. & Bergen Horse Car Company, of which you are Superintendent. The above money was collected by me and retained unlawfully while in the employ of the company. Yours,

EX-CONDUCTOR.

A $50 bill accompanied the letter, which was placed in bank as the nucleus of a conscience fund.

Ventilation of Cars.

[COMMUNICATED.]

Office of JOHN STEPHENSON COMPANY, NEW YORK, Dec. 29, 1885.

Editor American Railroad Journal:

Your issue of November has an article headed "Car Awnings," with: "Complaint is made in Mexico of the extreme heat often prevailing in the Pullman cars, caused . . . . by the fierce rays of the tropic Summer sun beating down on the roofs and heating the cars like ovens, etc."

In street-cars we have found like difficulty, though increased by foul air from the greater number of passengers in small space. Our remedy has worked well in street-cars, and there is good reason why it should work even better on steam-railroads where the high speed would tend to exhaust the air from the car more readily.

The "Loughin Patent," which we use, is a double roof to the car-body, or rather a ceiling below the roof, having a space between the ceiling and the roof, the ceiling finely perforated, through which the air passes, making its exit from the car at the open verges of the roof and carrying with it the refracted heat of the roof. As air passing through gauze does not move in columns but is broken into spray, offensive currents are avoided.

Five years' experience in our cars has established utility of the system.

JOHN STEPHENSON.

STREET-RAILWAY NOTES.

THE directors of the New York and Brooklyn Elevated Railroad Company have voted to consent to a first mortgage on the franchise and property of the company, and to authorize a contract for the construction of the proposed road from the Grand Central Depot in New York to various outlying points in Brooklyn, using the bridge as the connecting link between the two cities. The company claims to be the lessee of the Brooklyn Elevated and Atlantic Beach, the Brooklyn and Coney Island Central, and the Brooklyn City Elevated roads, and to have a capital of $11,500,000, of which $1,600,000 has been subscribed.

THE plan of using the enormous water power of the Alps for working electric railways in Switzerland is about to take a definite shape, the idea being to connect the towns of St. Moritz and Pontresina by an electric railway four and three-quarter miles long, the motive power to be supplied by the mountain streams; the line, in case the plan proves a success, to be extended a considerable distance.

THE St. Elmo Railway Company of Chattanooga, Tenn. is about to construct a line of street-railway, and the Chattanooga Street-Railway of the same city will construct another line.

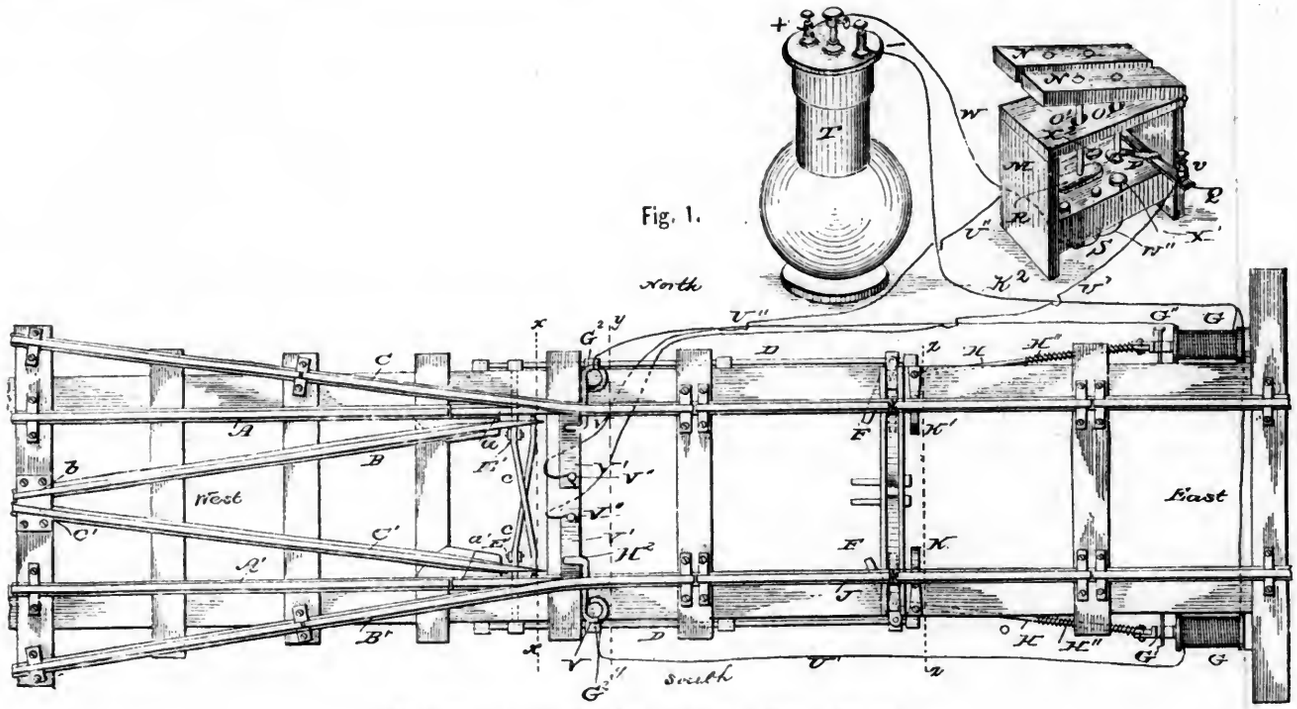
New Inventions.

Marshall's Dynamo-electric Railway Switch.

MARTIN MARSHALL, of Jamestown, N. Y., is the inventor and patentee of a dynamo-electric railway switch which is herewith illustrated and described.

The invention has reference to that class of railway switches which are operated automatically by the passage of the cars over the track; and it consists, mainly, in an electrical controlling device whereby an operator may cause a train passing over the track to operate or actuate any one of several switches, thereby causing the train to take the desired direction. The invention further consists in automatic devices for releasing the switches immediately after the passage of the train, thus opening the main line, and also in the improved construction, arrangement, and combination of parts for effecting the above results.

Fig. 1.



MARSHALL'S DYNAMO-ELECTRIC RAILWAY SWITCH.

In the accompanying cuts, Fig. 1 is a plan view of a track and switches embodying the improvements, showing also the electrical conductors, and showing in perspective a battery and the circuit-controlling device; Fig. 2 a transverse sectional view on the line *x x* in Fig. 1; Fig. 3 a transverse sectional view on the line *y y* in Fig. 1; Fig. 4 a perspective view, on an enlarged scale, of the circuit-controlling apparatus; Fig. 5 a transverse sectional view on the line *z z* in Fig. 1, and Fig. 6 a detail view in perspective of the hinged adjoining ends of the raised portion of the railway track. The reference-lettering is similar throughout all the cuts.

A A′ designate, respectively, the north and south rails of the main track, at the termini of which are hinged short switch-rails *a a′*, which normally connect the rails with the continuation of the main track, the rails of which, at the switch, diverge respectively in a northerly and southerly direction, as at C and B′, so as to form the north and south rails of two switches, the other rails of which are pivoted at *c′ b*, and are designated by C′ and B respectively.

J indicates a jointed portion of the rails of the main track, at which two short rails, A^2 A^2, are hinged in such a manner that their free adjoining ends are capable of moving vertically. The said adjoining ends are connected by means of a T-shaped plate B^2, the head of which is provided with slots to receive the pivoting-pins, while the shank of the plate is pivotally connected with a T-shaped lever I, pivoted to one of the sleepers near the center of the track. It will be seen that the construction is the same at the north and south rails. The free ends of the jointed rails are normally held in a raised position by means of suitably-arranged springs K. D D are rock-shafts arranged alongside the track, adjoining the rails of the main track. The ends of these shafts, which terminate at the rail-joints J, are provided with arms or cranks C^2, to which plates F are pivotally attached. These plates are provided with loops or staples D^2, connected by pivoted rods H with the spring-armatures G″ of electro-magnets G, located at the sides of the track.

H″ are traction-springs coiled around the said connecting-rods, and attached to the upper ends of the armatures and to the sides of the track, for the double purpose of keeping the spring-armatures normally off from the magnets and keeping the swinging plates F from under the T-levers I. The proportional arrangements of these parts, however, are such that when the armatures are attracted by the magnets the plates F shall swing under the T-levers I, so that when the rail-joints J are depressed by a passing train the T-levers shall descend upon the plates, thus vibrating the rock-shafts. The ends of the rock-shafts, which terminate at the switch, are provided with arms E, connected by links E′ with the switch-rails B and C′, respectively, the free ends of the latter being mounted upon pivoted links or rods E^2, mounted upon a cross-piece F^2, below the main track. The switch-

rail B is connected by a rod or brace *c*, with the switch *a'* of the south main-line rail A', and the switch-rail C' is likewise connected with the switch *a* of the north main-line rail A. It will thus be seen that when the northern rock-shaft is vibrated the effect will be to throw the switch-rails B *a'* in a northward direction, thus opening the southern switch or siding, while when the southern rock-shaft is operated the switch-rails C' *a* will be thrown southward, thus opening the northern siding for the passage of trains.

In the office of the operator whose duty it is to control the switches, is arranged a battery T, and a key-board or

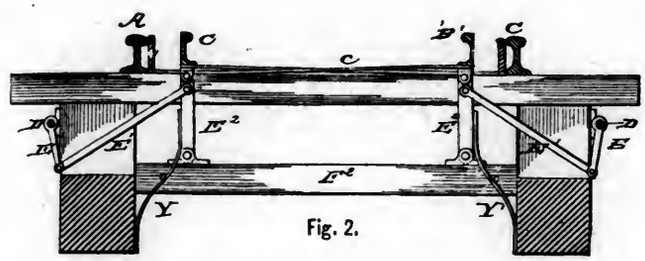


Fig. 2.

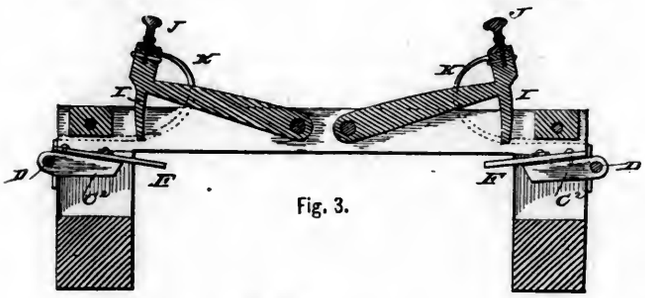


Fig. 3.

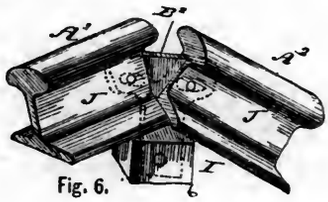


Fig. 6.

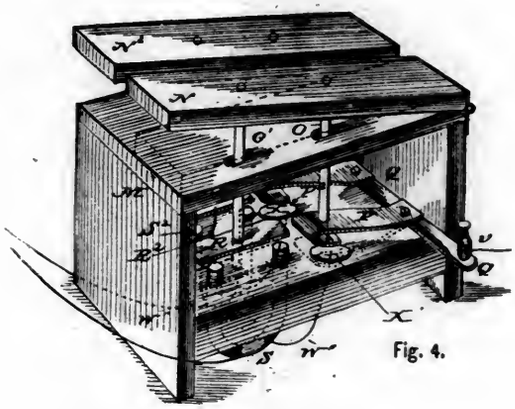


Fig. 4.

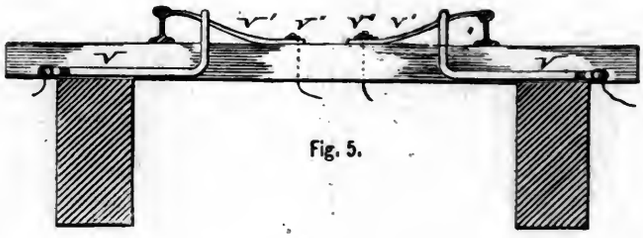


Fig. 5.

MARSHALL'S DYNAMO-ELECTRIC RAILWAY SWITCH.

frame M. The latter contains two electro-magnets S S^2, the armatures of which are connected by rods O', with the keys N' N^2, that are hinged to the upper part of the frame. These keys are also provided with rods O, arranged to bear upon spring conductors or cushions P P^2, the double function of which is to keep or sustain the keys normally in a raised position and to touch the contact points X' X^2 when the keys are depressed.

The windings of the electro-magnets are connected, respectively, as follows: One end of the winding of magnet S is connected with one of the poles of battery T, and its other end with the contact-point X'. One end of the winding of magnet S^2 is connected with the binding-screw V'' of a circuit-breaker, and its other end with the contact-point X^2. The springs or cushions P P^2 are mounted upon a bar Q, of copper or some other good conductor of electricity, one end of which is provided with a binding-post *v*.

V V are well-insulated keepers secured at the sides of the track near the switch, and having loops G^2 and arms H^2, which latter serve as contact-points for the springs V', which are secured to one of the sleepers by means of the binding-screws V''. The outer or free ends of the springs V' extend nearly to the rail-flanges, and occupy such a position that they shall be engaged by the wheel-flanges of passing trains and be thrown out of engagement with the keepers V.

It has been stated that the magnet S is connected directly with one pole of the battery T. The other pole of the battery has a double or twisted wire or conductor K^2, the branches of which are connected each with one end of the winding of one of the electro-magnets G, arranged at the sides of the track, as before stated. The magnet G at the south side of the track is connected by a wire or conductor U', with the loop of the keeper of the circuit-breaker at the south side of the track, the binding-screw of which is connected by a continuation of the said conductor U' with the binding-post *v* of the bar Q. The northern magnet G is connected with the keeper of the northern circuit-breaker, the binding-screw of which is, as has been already stated, connected with one end of the winding of the electro-magnet S^2.

The switches are held in normal position for keeping the main track open by means of suitably-arranged springs Y Y', as shown clearly in Fig. 2 of the drawings.

The operation of this invention is as follows: Under normal or ordinary circumstances the main line is always open, so that a train running in either direction would continue upon the main line if the electric keys were not disturbed. Now, suppose a train to be coming from east to west, and it shall be desired to switch it off upon the northern siding. The operator will then depress the key N of the electro-magnet S of his instrument, thus closing the circuit, which is as follows: From one end of the winding of magnet S to the pole of the battery T, which is marked +, from the other end of the winding of said

electro-magnet to the contact-point X′, thence through the contact-spring P, bar Q, binding-post *v*, and conductor U′, to the circuit-breaker V′ at the south side of the track, through the keeper of the same, and to the electro-magnet G at the south side of the track, through the windings of the same, and to the pole of the battery marked —, thus completing the circuit, the effect of this being to convert the electro-magnets S and G into active magnets. The former will retain its armature and the latter will attract and retain its armature G″, thus drawing the pivoted plate F under the T-lever I. When the train passes, it will depress the raised jointed portion J of the track, thus causing the T-lever I to strike the plate F and vibrate the rock-shaft D at the south side of the track, the result of which will be to open the northern siding, in the manner which has been already described.

If it shall be desired to switch a train off upon the southern siding, the operator will depress the key N^2 of electro-magnet S^2 with a precisely similar result, save that in this case the electro-magnet G at the north side of the track and its attachments will be influenced. The flanges of the wheels of the rolling-stock in their passage will depress the springs V′ which form the circuit-breakers, thus automatically breaking the circuit and releasing the armatures from the electro-magnets, so that immediately upon the passage of the train the main line will be open, without the necessity of the care of attendants.

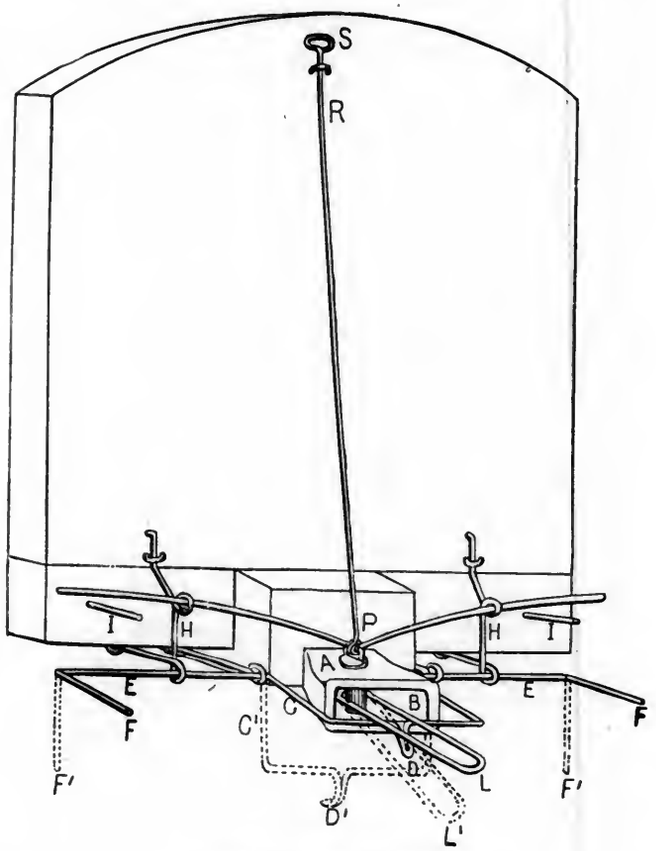
The construction of the device is simple, and it may be applied to railway-switches without any considerable expense. Under all ordinary circumstances the main line of the track is open, and accidents which frequently result from the neglect or mistakes of switchmen are impossible. The switches may be controlled by an operator located at any distance therefrom, whose duty it is simply to touch the proper key in order to set the desired switch for the passage of trains, the said switch being instantaneously and automatically released upon the passage of the train, so as to open the main line.

Owen's Safety Coupler.

LUTHER B. OWEN, of Cedartown, Ga., is the inventor and patentee of a safety car-coupler, which is herewith illustrated and described.

The accompanying cut shows the end of a freight-car with the coupler attached. A is a draw-head of the usual construction, provided with the slot B to receive and hold the link L. By the side of the draw-head is attached a loop or crank C, furnished with a curved tongue or projection D, the loop or crank extending in either direction to the sides of the car, in the form of rods E E, which are at their extremities bent into cranks F F. By raising either of the cranks F F, the loop or crank C is also raised, which in turn will raise the link L to meet the draw-head of the approaching car. The curved tongue or projection D, being struck by the draw-head of the approaching car, the loop or crank C is forced downwardly and backwardly, till it assumes the position C′, shown in outline, and when not coupled the link occupies the position shown in outline at L′.

The pin P is attached to a rod K, extending to the top of the car where it is furnished with a handle S. To the link are further attached rods H H, passing through eyes at H H, and when the pin is raised, these rods fall upon projections on the end of the car, one of which is shown at I, the contact of the rods with these projections occur-



OWEN'S SAFETY COUPLER.

ring before the pin is removed from the draw-head, thus preventing its removal and misplacement.

It is claimed by the inventor that this device is simple in construction, inexpensive, and that all necessity for going between the cars, and thus exposing the person of the train-hand to injury is entirely avoided. Cars employing the device can be coupled to cars provided with the ordinary link and pin, and it can be attached to any car without structural change and at small cost.

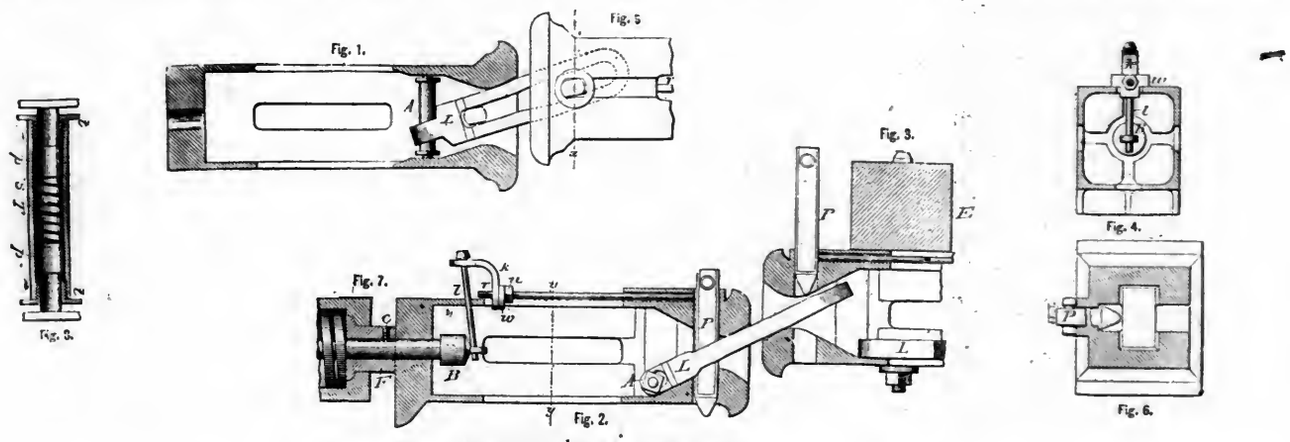
The coupler is owned and controlled jointly by the patentee and by Miller A. Wright, of Cedartown, Ga.

Randolph's Car-coupling.

RICHARD RANDOLPH, of Rockville, Md., has invented an improvement in car-couplers which is fully illustrated and described in the accompanying cuts and description.

Fig. 1 is a horizontal longitudinal section of the casting for the draw-head with a top view of the link L and its attachment A, showing their position when there is a maximum horizontal deviation of the two draw-heads to be coupled, and showing the form of the link, the loop of which is smaller at the back end than at the front to prevent the pin being raised through this end when the other end is connected with another draw-head. Fig. 2 is a vertical longitudinal section of the casting with a side view of the link and its attachment, showing their position when there is the maximum vertical deviation of the two draw-heads; also with a side view of the apparatus *l*, *k*, *w*,

n and *r*, for clamping the pin P and holding it in an elevated position until released by the pressure between the two draw-heads; also with a side view of the draw-bolt B, having a projection from its head, which operates the clamping apparatus, and showing the play between the head of the bolt and the casting. Fig. 3 is the front end of the same section as in Fig. 2, showing the casting drawn forward, as allowed by the play between it and the head of the draw-bolt, and resting upon the plate *f*, by which it is suspended from the end-sill E, of the car, also showing the pin as held in the elevated position by the pressure of the rod *r*, of the clamping apparatus shown in Fig. 2, and the position of the link L as stored within the casting when not in service. Fig. 4 is a transverse section of the casting and of the rod at the line *y y* in Fig. 2, showing the back end of the casting on the inside and the bearing of the head of the draw-bolt; also a front view of the clamping apparatus, showing the projection



RANDOLPH'S CAR-COUPLING.

from the head of the bolt through which passes the lever *l*, and the washer *w*, which sustains the apparatus upon the casting. Fig. 5 is a top view of the front end of the casting, showing the form of the pin-hole at the upper side and that of the upper end of the pin within the hole; also the ridge in the middle which protects the rod *r*, that plays through it longitudinally. Fig. 6 is a transverse section of the casting at the line *x x* in Fig. 5, showing the lateral contraction of the pin-hole at the top, and with a front view of the two ends of the pin, showing how it is confined to the casting by the shoulders on the sides of the pin at the lower end and by the small bolt riveted through the upper end after it is inserted from below. Fig. 7 is a longitudinal vertical section of the front end of Butler's patented spring-buffer, showing the front follower-sleeve F, in which sleeve is inserted a small screw *c*, which projects slightly into a groove of corresponding depth made in the draw-bolt B, the groove corresponding to the forward play of the bolt through the sleeve, the object being to insure the play between the head of the bolt and the casting required for deflecting the lever *l* backward. Fig. 8 is a longitudinal section and view of parts of the attachment A to the link, drawn on a scale two and one-half times greater than that of A.

The parts represented in Fig. 8 are the tube T and the taps *t t*, which are screwed into each end of the tube, and which have square collars projecting beyond the tube, to retain it within the slotted eye at the back end of the link, and which present shoulders on the inside of the tube, to prevent the escape of the pistons or plugs *p p*, which are forced apart by the spiral spring *s s* between them, and which play through the taps, but which are limited in their play by the shoulders upon their inner ends. The tube, with its contents, is attached to the link by the hand introduced into the casting through the opening in the under side, when the other openings are closed by the timbers, and then screwing in the taps with a wrench. When two draw-heads are to be coupled, in one the pin is raised and the hand inserted through the mouth and the link drawn fully forward with the pin restored to its position. The attachment will be drawn forward with the link without friction until it reaches the point where friction is required. This is where the interior width of the casting is reduced sufficiently to compress the spring within the tube to an extent which produces the required friction between the sides of the casting and the outer ends of the plugs, the tube being nearly at right angles to the sides, a position into which it can easily be forced by the manipulation of the link. Then the link will remain in any position in which it may be set, to correspond with the deviation of the draw-heads, and which may be determined by the eye. The friction of the attachment will also provide a sufficient resistance to overcome any legitimate resistance to the link at its front in gliding into the opposite draw-head, but will yield without injury to any other obstruction, and the link will retreat out of harm's way. The pin of the other draw-head is then raised to the full extent, and the link, if protruding, pushed back into the casting, which is now drawn forward until a pressure is brought upon the buffer-spring from behind. This deflects the lever *l* in Fig. 2, which transmits the pressure from the upper end of the lever through the knee *k* and the rod *r*, which is screwed into the knee, and thence at the front end of the rod to the pin. This pressure is sufficient to hold the pin in the elevated position, and the pressure will be maintained by the friction of the casting as it rests upon the plate *f* in Fig. 3. As soon as a pressure is exerted between the two draw-heads in their approach the lever is pushed back, carrying with it the rod. Thus the pin is released at the moment the link is in the proper position to receive it in falling. In the lever and the rod there is sufficient elasticity to yield to any play that may remain between the casting and the head of the bolt after the rod is made to

clamp the pin. This residuum of play is reduced to a minimum by revolving the rod in the proper direction, screwing it through the knee *k*, and the adjustment is maintained by the jam-nut *n*.

Heston's Improved Piston-packing.

WILLIAM HESTON, of Alliance, O., is the inventor and patentee of an improved system of piston-packing, which is herewith illustrated and described. The invention is especially adapted for use in the stuffing-boxes of steam

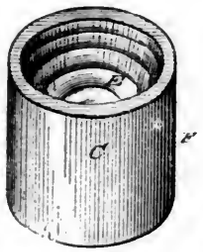


Fig. 1.

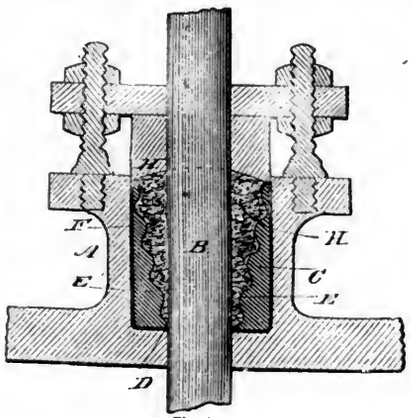


Fig. 2.

HESTON'S IMPROVED PISTON-PACKING.

and other engines, and it consists of an elastic corrugated packing-cup of rubber or other suitable material.

In the accompanying cuts, Fig. 1 represents a perspective view of the improved packing, and Fig. 2 a sectional view of a stuffing-box showing the packing in position. The reference-lettering is similar throughout the two cuts.

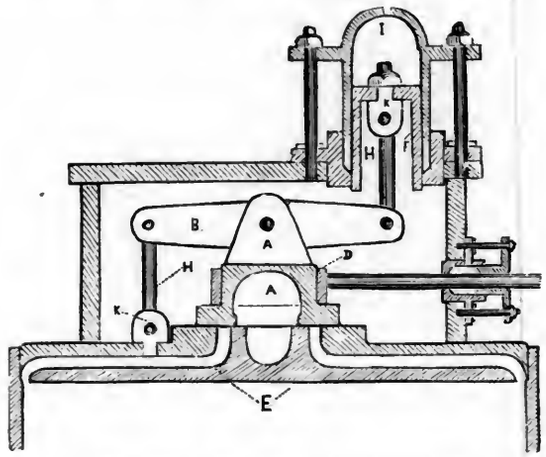
A denotes the stuffing-box, and B the piston. C is the packing, which is in the nature of a cylindrical cup, as shown in Fig. 1, with a circular hole D, in the bottom, adapted to fit around the piston. The inside of this cup forms an inverted cone, with ribbed or corrugated sides, as shown at E, the thickness of the corrugated rubber wall decreasing in thickness from the central aperture D, toward the upper edge. The exterior of the cup may be protected by a lining or casing F, of duck, canvas, or similar material.

In using this packing the cylindrical cup is placed in the stuffing-box, as shown in Fig. 2, and the space between its corrugated inside and the piston is packed with loose hemp, as shown at H. This hemp should be loosened and dampened and packed into the cup snugly and tightly all around the piston, and if it should be found to leak at any time more hemp may be added, and thus effectually prevent leakage without the necessity of screwing up the gland. The horizontal corrugations E on the inside of the cup will prevent the hemp from working out of the same by the reciprocations of the piston, thereby at all times holding the inside hemp-packing firmly in its proper position.

Bewsher's Balanced Slide-valve.

JAMES BEWSHER, of Kansas City, Mo., is the inventor and patentee of a balanced slide-valve, of which an illustration is herewith given. The inventor claims for his device that it will accomplish everything possible by an automatically balanced slide-valve, and that there is a saving of ninety per cent. of power required to work the slide-valve, an economy of steam, and a great saving of the wear and tear of the working parts.

A A is the slide-valve with lugs on top; B is an equalizing beam or bar pivoted to the valve at the center; H H are two links, one end of each being pivoted to the equal-



BEWSHER'S BALANCED SLIDE-VALVE.

izing bar at its end, and the other ends pivoted at K K; F is a hollow plunger, packed with any preferred packing used on piston rods, etc., where a gland is used; D is a section of the valve-yoke; E are steam ports to the end of the cylinder. The top of the gland forms an arch to keep dirt from getting into the working parts, and has a small hole in the top to allow the steam to escape in case of any leakage. Its operations are as follows: As the valve reciprocates, the beam also reciprocates; the ends of the links connected to the beam, also reciprocate, and as the links at the other end have stationary connections, the links describe an arc, in opposite directions to each other —hence the beam has a parallel motion at the valve. The pressure of steam being only on the plunger, on the side next to the steam-chest, it has a lifting power equal to its area multiplied by the pounds of steam, and is resisted by the valve, and relieves the valve of its heavy load, due to the power of the piston.

The slide-valve is automatic, and rigidly connected, and is not affected by expansion nor contraction, while no springs nor adjusting screws are necessary. The wear upon the valve is claimed to be nominal as the great friction is practically transferred to the links, and what little wear there is, is taken up by the piston, making it self-adjusting.

Scale in Steam Boilers.

A VERY useful discovery was recently made in California of a process for removing scale from steam boilers, and like many other discoveries was the result of accident. Mr. George Dorvine, the proprietor of a flouring mill at Salinas City, was in the habit of filtering water in an old heater in order to free it, as far as possible, from the impurities that formed the scale in his boiler. After running the water through the heater he let it drain through straw. One day, being out of straw, he gathered together the leaves of a Eucalyptus tree that stood near the mill and used them instead. He was surprised on finding

soon after that not only had the formation of scale been stopped, but that the scale already in the boiler had been removed. He continued experiments and imparted his discovery to others who have subsequently introduced the extract made from the leaves of the tree in the form of a dark brown liquid, on boilers all the way from San Francisco to New York, and are meeting with great success. The manufacturers of this article claim that the extract, aside from its ability to remove the scale, preserves iron from rust. This extract is obtained by boiling the leaves of the Eucalyptus tree in steam boilers under a pressure of steam.

Preserving Railway Sleepers.

AT the recent convention of the German Railway Union, a report on preserved sleepers was presented, which was supplementary to a previous report published some years ago. Of the railways answering the circular of inquiry sent out by the committee, thirty-four used preserved sleepers now, against twenty-four in 1868. The number of railways using each of the methods of preservation in 1865, 1868, 1878, and 1884 was:

	1865.	1868.	1878.	1884.
Sulphate of copper	15	6	5	1
Sulphate of iron and zinc	1	—	—	—
Sulphate of barium and oxydul of iron	2	—	—	—
Corrosive sublimate	3	6	8	4
Chloride of zinc	8	7	20	22
Creosote	4	5	13	11
Chloride of zinc and creosote mixed	—	—	4	7
Vapor of creosote, Paradis' patent	—	—	—	1
Vapor of creosote & creosote (Blythe's system)	—	—	1	1
Antisepticum under pressure	—	—	—	1

Thus sulphate of copper, which was the prevailing method used in 1865, is now used by but one railway, but the use of chloride of zinc has extended until it prevails, and alone or in combination with creosote is used by twenty-nine out of forty-eight railways which use any preservative. Creosote alone, however, is still extensively used, though less so than in 1878.

The Westinghouse Brake in France.

THE Western Railway of France was the first French road to adopt the Westinghouse brake and has now in use 3,057 cars equipped with that brake. This road connects Paris with Versailles and the shipping ports of Western France. The following record is given of accidents prevented by the use of the air-brake on its lines:

1880 to 1884, six collisions avoided.

1879 to 1884, ten cases of persons crossing the line outside stations.

1879 to 1884, seventeen cases of persons crossing the line inside stations.

1879 to 1882, three cases of obstacles, such as horses and carts, etc., unexpectedly found on the line.

1880 to 1882, six cases of rolling-stock standing on the line, or being shunted, and not removed in time. Total, forty-two.

Making Railway Travel Safe.

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Patents Industrially Classified.

A TABLE prepared by Commissioner Butterworth shows that of the nearly 300,000 patents issued by the Government, the various lines of machinery and industries have received the following number:

	No. Patents.
Applications of electricity	5,872
Artesian wells	500
Beds	2,150
Boots and shoes	5,060
Bread and cracker machinery	440
Chairs	1,580
Corset patterns	969
Dairy utensils	2,429
Fences	2,888
Fire engines	567
Fire escapes	884
Harvesters	6,606
Lamps and gas fixtures	5,254
Laundry utensils	4,993
Machines for knitting	754
Metaling	3,814
Metal working machines	10,203
Methods of tanning hides	1,219
Mills and thrashing	6,740
Nut and bolt locks	734
Plows	6,889
Pumps	3,156
Railways	3,508
Railway cars	3,505
Seeders and planters	3,568
Steam engines	5,111
Stoves and furnaces	8,238
Vegetable cutters	450
Water distributers	3,719
Wearing apparel	2,417

These aggregate 104,217, or a little over one-third of the entire number of patents issued.

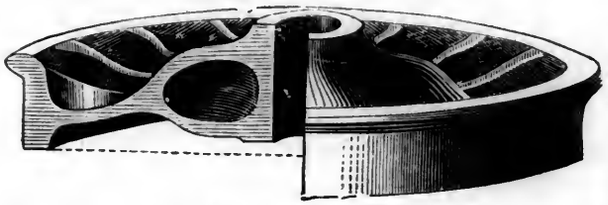
The First Patent.

THE first patent granted to an inventor in the United States is mentioned in a speech of ex-Senator Wadleigh of New Hampshire, in the Forty-fifth Congress. The Senator said: "An intelligent gentleman of my own State has referred me to an Act of the general court of Massachusetts Bay passed in 1646, granting to one of his ancestors, Joseph Jenks, the exclusive right of making and selling his improved scythe for the term of fourteen years. That, I think, was the first patent granted to an inventor in America. The improvement referred to changed the short, thick, straight English scythe into the longer, thinner, curved implement with stiffened back now in use."

GEO. H. HOWARD,
Counsellor in Patent Causes and Solicitor of Patents.
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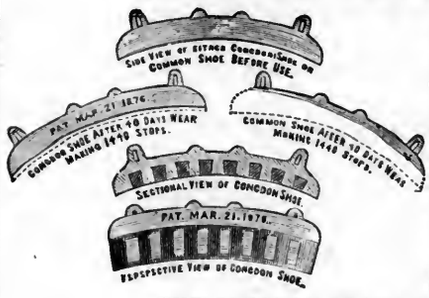
VALVE-OLEUM.
E. F. DIETERICHS'
Cylinder, Engine and Machinery Oils
CLEVELAND, OHIO.
Patented 1874, '75, '76, and July 4, 1882.

Ramapo Wheel and Foundry Company.



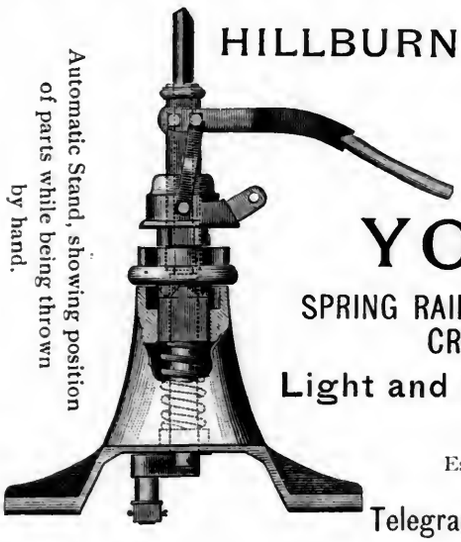
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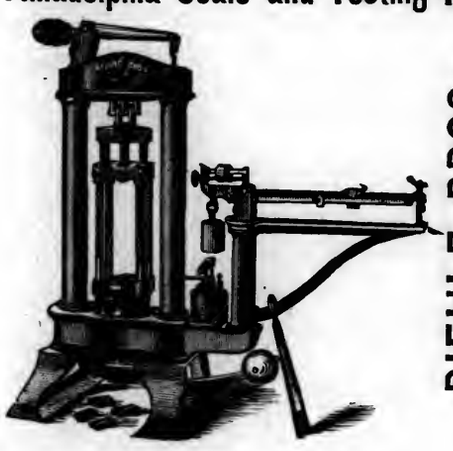
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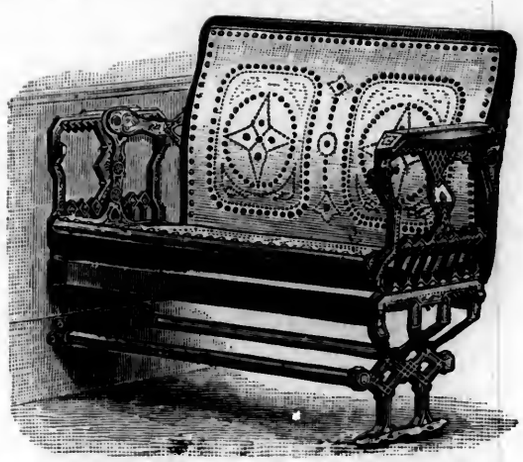
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WHOLE NO. 2,561.] NEW YORK, FEBRUARY, 1885. [VOLUME LVIII.—NO. 11.

THE IRON INDUSTRY IN ITS RELATION TO RAILWAYS.

BY S. H. FINCH.

[Written for the AMERICAN RAILROAD JOURNAL.]

IRON is by far the most important of the metals, and there are few substances to which it yields in interest when it is considered how very intimately the knowledge of the properties and uses of iron is connected with human civilization.

Metallic iron is of exceedingly rare occurrence; it has been found at Canaan, in Connecticut, forming a vein about two inches thick in mica-slate, but it invariably enters into the composition of those extraordinary stones known to fall from the air, called meteorites. Isolated masses of soft, malleable iron also of large dimensions lie loose upon the surface of the earth in South America and elsewhere, and are presumed to have the same origin; these latter contain in common with the iron of meteorites, more or less nickel. The iron industry covers a very large field, and space afforded does not admit of even an effort at a comprehensive consideration of it, involving, as it does, so many varied interests, for while an accurate record of railway building since its inception would be a satisfactory index of the iron industry, it would not tell half the story.

In a former number of the JOURNAL, in connection with this subject, I gave a statement of the total pig-iron production of the world, which was prepared with a view to make it as accurate as possible. It may be well, perhaps, to supplement this with some further statistics concerning the use of iron and steel as affected by the construction of railways during the past ten years for rails alone.

In 1873 there were only 890,077 tons of rails manufactured in the United States; in 1874, 729,414 tons.

In 1875, 290,863 tons of steel, and 501,649 tons of iron.
In 1876, 412,461 tons of steel, and 467,168 tons of iron.
In 1877, 432,169 tons of steel, and 332,540 tons of iron.
In 1878, 550,398 tons of steel, and 322,890 tons of iron.
In 1879, 683,964 tons of steel, and 420,160 tons of iron.
In 1880, 954,460 tons of steel, and 493,760 tons of iron.
In 1881, 1,330,302 tons of steel, and 488,581 tons of iron.
In 1882, 1,438,155 tons of steel, and 227,874 tons of iron.
In 1883, 1,500,200 tons of steel, and 200,000 tons of iron.

At the close of 1875 there were 713 blast furnaces in the United States, and 10 in course of construction; of this number, 420 were out of blast.

Dec. 31, 1877, there were 270 furnaces in blast and 446 furnaces out of blast.

Dec. 31, 1883, there were 307 furnaces in blast and 376 furnaces out of blast.

The price of rails which, in 1867 was $160 per ton, fell to $75 in 1875; to $45 in 1878; and a contract has recently been closed for 10,000 tons at $25.50 at the mill, which is an extremely low price, and a serious question arises as to the possibility of manufacture for the price stated.

In 1874 there were 91 rail mills, although 22 were idle, and the capacity of the entire number was double the actual production. How far this question of price and production has been influenced by the failure of the owners of the Bessemer plant to introduce the "Gilchrist-Thomas" or "basic" process—which they also own—is of course a matter of conjecture. It is probable, however, that the consumers of iron and steel would be benefited largely if this process is available in the reduction of ores that are not adapted to the Bessemer system of steel-making; these ores being known as low grade ores, but having the equivalent advantage of so much less haulage as to make it appear probable that the cost of finished product would be lower than Lake Superior ores when worked by the Bessemer system.

But iron and steel-making is not confined to the production of rails, and new uses must be found in order to utilize the enormous capital invested in steel-works, and absorb an equally great amount of labor.

One of the most prominent tendencies of the present time, as well as one of the most interesting applications of engineering skill, is the substitution of iron and steel for timber, wherever the change can be made with advantage, and more especially in connection with railway appliances. The object of the change may be either to reduce the cost of construction or to increase the strength and durability, thus prolonging the life of any structure and resulting in economy of maintenance. The timber production of America has been estimated at ten thousand millions of superficial feet, or more than eight hundred millions of cubic feet, an amount far beyond the grasp of comprehension. About one-sixth of this vast amount goes to the maintenance of railways and five million cubic feet is used for telegraph-poles.

That metal, as iron or steel, has not yet been tried to any extent in this country as a substitute for wood in railway-ties is well known, but existing circumstances would seem to warrant a consideration of undertaking such a change in railway repairs. The 120,000 miles of railway in the United States, require no less than 260,000,000 ties—and if the average life of each may be put at seven years it will be seen that 37,000,000 of ties become useless each year—there would annually be expended in the United States for railway-ties not less than $15,000,000; and should there continue an increase in miles of road and performance on existing roads, the price of wood ties will rapidly increase unless methods of preserving the timber should be very generally adopted or the substitution of a more durable material than wood, viz., iron or steel.

Iron railway-ties have been to quite an extent intro-

duced in Europe and on some East Indian roads, where it appears that the cost of maintenance as compared with junglewood, was found in five years to be as three to one in favor of metal ties.

It is not proposed here to recommend any special design of tie to be made of iron or steel as a substitute for the ordinary wood tie, but rather to mention such features as may be considered desirable in selecting a design, and to indicate the possibility of making such substitution, and the advantages that are believed would follow, which would be chiefly in the improved condition of roadway and a large reduction in cost of repairs.

The stable nature of iron or steel as compared with wood, when used under conditions of exposure in this climate, would seem to secure an improved surface, uniformity and smoothness of track not attainable with the wood-tie. Now the requirements of an iron or steel tie would be that:

First—They should be of such form, and so arranged as to distribute the weight of passing trains over the whole width of embankment.

Second—They should be so constructed that but little or no skilled labor would be required to lay properly and fasten the rails accurately to gage, without any possibility of variation.

Third—There should be the same area of bearing surface as with the wood-tie.

Fourth—They should be as convenient for leveling the road or taking out a rail when necessary.

Fifth—They should be convenient to handle in loading and transportation.

Sixth—They should consist of as few parts as possible, not involving the necessity for peculiarly-constructed bolts, nuts, or washers, or differential holes for accommodating any change in gage on curves.

Seventh—They should combine elasticity with all the strength of the wood-tie necessary to prevent spreading of the rails.

Cottages for laborers and miners could doubtless be constructed of iron at about the same cost as wood, and the stations of the elevated railways in this city afford examples of what may be done in that direction. Iron tents or barracks for troops in regular service also, would open up another field for iron trade. In the construction of coal and freight-cars, it is believed that iron must soon take a prominent part, although experience so far has not been as satisfactory as anticipated.

And although the change from iron to steel so largely accomplished in relation to rails and steam-boilers has diminished the relative production of iron, yet successful attempts have been made to produce a higher quality for special purposes, and the total production of both iron and steel may be expected to continue in growth with the conviction that the minimum price is now about reached. As iron grows cheaper the area of its use will extend, and we shall thus have a larger production of finished iron, though the value per ton is proportionately lower.

In all branches of the coal and iron trades wages have retreated in sympathy with the price, and now are perhaps as low or lower than for years, and probably raw materials are also at their lowest. The dullness in the demand has marked itself thus, and its effects are seen in all branches of the trade as well as felt by all classes connected with it. Wages and rates are at their lowest, full time is far from being known at the mines or mills, and there has been, during the last year, a very large decrease in operating expenses of nearly all kinds, and a consequent advancement towards a sound footing on the threshold of another season of prosperity.

There seems to be little prospect of an immediate revival of railway building in this country, and it may not be judicious to wait for large enterprises to be initiated in that direction; but rather to open up a more extended market beyond the border of the United States, as Mexico and South America, and distant China is almost ready for the introduction of railways and the allied industries. It is true that Mexico has valuable iron deposits as well as of the precious metals, but it is also true that some time is likely to elapse before the manufacture of iron can be carried on in that Republic in so economical a manner as to compete seriously with our own skilled steel-makers.

THE REQUIREMENTS OF A PERFECT COUPLER.

BY RICHARD RANDOLPH.

[Written for the AMERICAN RAILROAD JOURNAL.]

AS THERE have been issued between three and four thousand patents upon devices for car-couplings, and as none of them have been found to answer the requirements of railway practice, the construction of a perfect coupler is justly considered a difficult mechanical problem, and a standing challenge to the ingenuity of inventors. An examination of these attempts proves that the great majority of the inventors have not informed themselves of the conditions of the problem in practice and have wasted their ingenuity upon false assumptions.

The most common of these assumptions is that the two cars to be coupled will coincide vertically; and the fact is overlooked that, however identical may be the pattern of the cars, the elevation of the couplers will depend upon the extent to which they are loaded; as all of them must rest upon springs, and all springs are compressed nearly in proportion to the compressing force, and also that springs become permanently compressed after a length of service and from the great inequality incident to the variations in the character of the steel and the process of tempering. Another cause of the vertical displacement of the coupler is the straining of the timbers and bolts which hold them in position, by the irregularities of the track over which they pass at full speed.

The next erroneous assumption is that the couplers will coincide horizontally. But as the traffic of railways requires a variety of cars, and as the different car-builders have different ideas of the proper proportions of cars of the same character, the central point at the ends will vary from the center of the track upon curves according to the distance between the trucks and the distance from the trucks to the ends. And there are many points in the yards and about switches and sidings where the irregularities of the track, independent of curvature, will prevent the couplers from coinciding horizontally. And, as in the case of vertical deviations, the straining of the timbers and bolts during the service will give a permanent set to the couplers to one side.

These facts show the necessity for the couplers being

independent of a considerable deviation, both vertically and horizontally, in the act of automatic coupling; and of equal importance is it that the connection should freely allow of the constant movement of the connected ends of two cars in all, and in contrary directions, incident to tracks in the best condition, where the speed of the train develops these sudden and forcible actions from the slightest irregularities; otherwise the parts of the coupling apparatus will be either strained, bent or broken.

To meet these unavoidable conditions, a link common to the two draw-heads and capable of deflecting in all directions is absolutely indispensable, a fact which long experience in railroading has fully demonstrated. After the multitudinous contrivances and experiments that have been made in the attempt to improve upon the process of coupling, the link and pin have constantly held their impregnable position; and it may be safely asserted that when we consider only the operation of the link and pin coupler most commonly employed to-day, after the connection is once made, it cannot be materially improved upon. The question then occurs, in what does the common coupler need alteration and addition, and in what requisite is it wanting?

The first and by far the most important requisite is safety to the employé who operates in the process of coupling. The coupler should do of itself that which he now constantly exposes life and limb to do. It should hold the link of one draw-head in the proper position and with the necessary firmness to enter the unoccupied mouth of the other according to the deviation of the two in any direction. It should hold the pin of the latter within its hole high enough to be entirely clear of the mouth and drop it at the instant the link has fully penetrated it, while the operator stands to one side watching the process entirely clear of the cars.

So much for the question of safety. But there is another consideration which may be of more influence with a large class of persons; that of economy. When we consider the great number of links and pins that are lost and stolen, and the delay and vexation caused by the necessity of supplying those that are missing in the yards and along the line of the road, it becomes a desideratum that both link and pin shall be permanently attached to the draw-head, but in such a manner that they shall not interfere with each other, and allow both to act in connection with the ordinary coupler. As a great many links are bent and broken, from the fact that they are left protruding from the draw-head to receive the impact of contiguous cars, it is essential that the draw-head should be prismatic in form and hollow, so as to be capable of receiving the unemployed link entirely within it, out of the reach of this injury and out of the way of the employed link; a form which happens to be the one that is most conducive to strength as it transfers the force of impact in the most direct lines to the points of resistance at the dead-block behind it.

Such an improved coupler should be simple and strong in construction, free from derangement, and require the least amount of material and workmanship. It should require no alteration in the structure of cars now in use, and be perfectly adapted to couple with the draw-heads in common use, and with the ordinary link and pin, should the link or pin, or both, of the improved one be removed. It should also be itself the medium of transferring the force of a sudden push or pull to the spring-buffer and dead-block in such a manner that the same spring shall operate in both directions, and that the same connection of the draw-bar to the draft timbers shall serve for both dead-block and draft and spring-buffer; otherwise separate apparatus will have to be provided, increasing the cost and diminishing the efficiency.

We frequently have heard the fact boasted of by the inventors of couplers, that a long train of cars have been all coupled by a single backing of the engine; as if this feat were any indication of the value of the coupler. This can be done with most of those which are utterly worthless in ordinary railway practice. And the very fact that couplers are liable to connect with contiguous cars without a previous adjustment is of the greatest disadvantage; for thus cars will be frequently connected accidentally and carried off either prematurely or in the wrong direction, necessitating the delay and labor of disengaging them. Besides, such a thing as the simultaneous coupling of a number of cars is never required in practice. It is either with a single car or with a number already connected that it is requisite, in almost every instance, to couple at one time. And however perfect may be the automatic action of the coupler, the importance of certainty in such a matter will demand that every act of coupling shall be witnessed by an operator if not induced by him, in which case there is no appreciable additional expense of time and trouble for the witness to make the adjustment.

There is no necessity for any apparatus for uncoupling to be operated from the top or sides of the car. The cases in which it is necessary to uncouple while the cars are in motion are too rare to justify any additional contrivance for the purpose; and there is not the slightest danger in going in between the cars while they are standing still. It is impossible for a train to start so suddenly that the most stupid may not disengage himself; and no car will ever be constructed that does not secure standing room between two end sills, either by means of the draw-head alone or by dead-blocks on the middle of the sill, such as would require a collision at full speed to crush. With the draw-head in the form of a prism having everywhere the full diameter of the space between the draft timbers, and this abutting against such a solid resistance as the casting of Butler's buffer, and projecting the proper distance from the end sill, the two cars are as securely separated the assigned distance for safety as can possibly be accomplished by any dead-blocks upon the sills.

In order to adjust the link to the proper position for entering the opposite draw-head it does not require that the cars shall be nearly in contact; they may be a considerable distance apart, yet the eye of the operator can with accuracy set the link in the proper position to allow for the deviation of the two draw-heads. He may then retire if the coupler will do the rest.

As in the general system of the railways of the country, trains are composed of cars from every quarter and constructed according to the different plans of as many builders; and as this want of uniformity is the principal cause of the frequent maiming of the unfortunate trainmen, it is important that the car-builders of the country should agree upon some standard for the construction of the ends of the cars, and upon one that shall involve the least danger to those who handle them.

PRIMITIVE RAILWAY SERVICE.

BY WILLIAM S. VEST.

[Written for the AMERICAN RAILROAD JOURNAL.]

WHEN the first railways in this country were completed the question arose, "Who and where are the men competent to take charge of them?" It was a difficult problem to solve, for no one had, of course, any experience in the new and novel mode of traveling, fast coming into general use. Under the circumstances, it was perhaps natural that the engineers who built the roads should be selected as their superintendents. This was done in many instances, and not always to the benefit of the stockholders. In some cases it was soon made manifest that a good civil engineer and surveyor might be utterly wanting in executive ability and business capacity: essential qualifications required for the successful management of a railway.

Some roads virtually made their presidents superintendents of transportation, giving them autocratic power over all the various departments, machinery included, and most of the roads suffered greatly in consequence from misplaced energy and ignorance. It is probable that this evil existed in a greater degree in the Southern States than at the North. The writer can well remember many instances of their folly and—what in these enlightened days would be called—stupidity. One president of a first-class Southern railway, hearing of the advantages derived from eight-wheeled freight-cars, ordered one of extra length to be built with twelve, the extra wheels to be placed in the center. As the car was made of wood, and not of india rubber or whalebone, it of course ran off the track at the first curve it encountered.

Another president, a man of wealth, and prepossessed with the idea that he had an "inventive" mind, ordered a smoke-stack to be constructed, which he confidently asserted would entirely do away with the annoyance caused by live cinders and sparks, of which all passengers complained. When it is known that this wonderful "spark-arrester" was simply an ordinary smoke-stack bent in a half-circle six feet above the boiler, and coming vertically down in front of the fire-box to within a foot of the track, it is unnecessary to say that it was a ridiculous failure. A railway president anxious to show his authority, and also his knowledge of machinery in the presence of the writer, abused an engineer for allowing his piston-rods to get hot. Considering that the locomotive had just stopped after running nearly a hundred miles at a high rate of speed, it would have been a miracle if they had been cold.

But if the railways found it a difficult task to secure competent men to superintend them properly, it was still harder to obtain trustworthy engineers and firemen. Their only chance was to take machinists from the shops to act in the former capacity. Many of them became, in a few months, expert in performing all the duties required of them. Most of the locomotives in the Southern States were built in England—of a make and pattern utterly unsuited for the crude, imperfectly constructed railways then in existence in that part of the country. They were more complicated than those of the present day, and much more liable to get out of order. It was not until about the year 1838 that the engines made by Norris, Baldwin and other eminent American builders, put a stop to the English importations; their greater adaptability to our railways with their short curves and heavy grades, only then being fully acknowledged.

As the railways rapidly increased, so did the demand for skilled engineers, in a still greater ratio. To meet this difficulty, some roads promoted their firemen, who, after a few weeks of experience as such, were made to act as engineers, commencing with freight-trains only. They received fully $20 per month less than those who considered themselves "regulars" in the service, and who called the new recruits "corn-field" engineers. Nor was this appellation inappropriate—most of them being totally uneducated, and much more capable of plowing well than of running a locomotive. Flues were burnt out and brasses and journals ruined weekly—evils resulting from carelessness and a lack of intelligence. The writer has known of a passenger-train being delayed for hours simply because the newly-promoted fireman did not know how to run his engine with one cylinder, and of another train standing still all night in a swamp in the sickly month of September, the long delay being caused by the slipping of the eccentrics on the axle from the loosening of the set-screws. A hammer and a monkey wrench would have set the train in motion in a few minutes, provided the engineer had known how and where to use them. These were small matters when compared to the damage done to brasses and journals simply from being keyed too tightly. The amount of oil consumed by these greenhorns was appalling. If the learned contributor who writes so ably for the JOURNAL on "Lubricants" had witnessed the waste which for years took place without any successful attempt being made to stop it, he would no doubt have been overwhelmed with astonishment.

In the Southern States, most of the firemen were negroes—some free and some slaves, the owners of the latter receiving comparatively high wages on account of the extra risks to which their property was subjected. As negroes were never in the line of promotion, many of them were, simply as firemen, superior to some of the Caucasian race, and could be found acting in that capacity for years on the same railway. As a rule, they gave more satisfaction than the uneducated white man, and became experts from long experience. They were more obedient than the white fireman, and took a greater pride in keeping their engines clean. It is somewhat strange in these radical days, when negroes have figured in our national councils as Senators and Representatives, that not one—so far as the writer's knowledge extends—has been employed as engineer on any railway in the United States, North or South. The prejudices of the traveling public may account for this fact. Colored men are engineers on steamboats, at rice and saw mills, scattered over the entire South, but none are to be found on a railway, and from the railway standpoint none should be found. If a negro, running a passenger-train on any railway, North as well as South, should meet with an accident involving loss of life, even if the disaster was plainly unavoidable and no fault of the sable engineer, what a shout of indignation would roll over the land! The officers of that unhappy railway would have a hard task to convince the public that the misfortune was not caused by either the incompetency or carelessness of the

unfortunate darkey. Knowing this, all Southern railways employ white men only to take charge of their locomotives, and they will probably do so for many years to come.

Crude as may have been the railways of those days, the train equipment was cruder still, and the same ignorance and incapacity was visible in every department of the service. Skilled labor was not only at a premium, but absolutely unattainable, and it has only been by the work of years that the present high state of intelligence and capability on the part of engineers and train-hands generally has been evolved. Great as has been the growth of the railway industry within the writer's recollection, the wonderful increase of effective train-service is equally surprising, and in view of the ignorance prevailing in the primitive days of railroading in this country, the chief cause for marvel is that accidents were as few as they were. Deprive our present leading railway lines of their skilled labor of to-day, and give them the ignorant train-hands of fifty years ago, and their "progressiveness" would not strike us with pronounced vigor. The fathers of American railways had much to contend with, and in view of the drawbacks under which they labored, the success which they attained, limited as it was, is most remarkable, and the candid observer is forced to conclude that the increased speed and comfort of modern railway travel is as much due to the superior intelligence of the employés as to the energy and talent of railway management, though the former is a not unnatural outgrowth of the latter. The recognition of the value of intelligent service is one of the cardinal points of executive ability, and in fostering a growth of intelligent train-service, the railway manager shows his energy in the most convincing light.

THE VARNISHING OF PASSENGER-CARS.

BY D. D. ROBERTSON.

[A Paper read before the Master Car-Painters' Convention, Boston, Mass.]

THE subject which the association has assigned to me for this convention has always been regarded as important. There is no branch of the business which gives the painter more anxiety than the varnishing department. It is more susceptible to an endless variety of difficulties and therefore needs more close and careful attention than all other branches put together, and even with all the research and practical experience which has been given to the subject, we are yet far from coming to a definite conclusion as to the causes of many of the unfavorable results.

Beauty and durability is what we aim at in the paint-shop, and from my experience in varnish work, we may have beauty without durability; but we have rarely durability without beauty, so that the fewer defects of any kind in our work, caused by inferior material, inferior workmanship or any other cause, it is more likely to be durable, and ought therefore to possess beauty. There are certain qualities absolutely necessary to durability in varnish. The materials of which it is made must be of the proper kind, pure and unadulterated, the manipulation in manufacturing must be correct as to time, quantities, temperature, handling, etc., and age is also necessary. The want of durability arising from the quality of the materials, or from the manner of manufacturing, the painter has no control over; but let me say here that frequently a first-class varnish has been used upon a car, and after being in service for a short time it deadens, checks, cracks, chips, or flakes, and therefore shows a very poor record. The varnish is condemned, when in reality had the varnish been applied under different circumstances and over different work, the result would have been good and the durability satisfactory. I am satisfied that in many cases first-class varnish has to bear the odium, when the root of the evil is to be found nearer the foundation. The leading varnish manufacturers of this country have expended large fortunes to secure the best skill and appliances, and indeed to do everything to bring their goods to perfection. Their standing and respectability puts them beyond suspicion, and their reputation is of too much value for them knowingly to put into the hands of large consumers an inferior article, and even when we have just cause to complain of the varnish we ought to be charitable enough to attribute the mistake to circumstances beyond their control (for every kettle-full is subjected to such circumstances), and not to charge them with using cheap or inferior material for the sake of gain.

If the question which has been given me means to give some method of testing before using, I confess my inability to answer. For varnish, to be pronounced "durable," must be composed of the materials to make it so, and to ascertain this, chemistry must be called in to test it. Comparatively few painters understand chemistry sufficiently to analyze, and if they did and found the material all that is necessary, the manipulation may have been defective, so as to injure its wearing qualities, and therefore I cannot suggest any way of pronouncing varnish durable before using it.

As to the common custom of hanging out boards prepared and varnished, to the exposure of the sun and weather for months, it does not seem to me to be the correct way of testing durability. It is true we may by this mode get some idea of wearing properties, but the most thorough and correct way is to put the varnish to the same exposure, the tear and wear that it would have in the regular service on the road on which it is to run. Cars while running are exposed to circumstances which boards on the wall are not subjected to. The cars under my charge run through two different countries and three different States, and are therefore subjected to such a variety of climate and soil that the testing by stationary boards would completely fail to give the correct result. For example: I have placed two sample boards, prepared and varnished, and exposed them to all kinds of weather and to the constant and steady rays of the sun for an equal length of time, and both gave favorable results; and I have also put the same varnishes on a car and found very different results. One of the varnishes having some properties better adapted to resist the friction caused by cinders, sand and dust, is consequently not so liable to cut the surface, and therefore much more durable.

The system which I adopted long ago, and to which I still adhere (not on account of "old fogyism," but for want of better), is as follows: I have two varnishes which I want to put into competition to test their relative merits. With Varnish No. 1 I do the south half of the east end of the car and the east half of the south side of the car, the north half of the west end, and also the west end of the

north side; this is also done with the same varnish. On the other half of the car varnish No. 2 is put.

Thus you will see it is so placed that should the car be turned at any time, both varnishes on each side will have the same exposure and circumstances to contend with. This I regard as the best method to test the durability of varnish. And again let me say that it would be wrong for me to argue that because the varnish which I use gives me the best results, therefore I would regard it the best for all to use. This would be wrong, inasmuch as we have a diversity of climate between Maine and California, and between the extreme Northern and Southern States. The varnish which has failed to give me satisfaction may be most suitable for other parts of the country.

As to the second part of my subject, "What length of time may a car safely remain in service before being taken in for re-varnishing?" This must be regulated by the nature of the run and the general treatment of the car while in service. Through cars are frequently continuously on the road and little or no opportunity can be had to attend to them while in service. Such cars should be called in earlier than those which make shorter runs, and where ample time is allowed at both ends of the journey to be kept in order. And again, cars which are run nearest the engine cannot make so large a running record as those less exposed. Some roads—for a variety of reasons which might be given—can run cars for fourteen months with less wear than others can run twelve months. So that I hold that the master painter on every road should keep a complete and correct record of his cars, and have an opportunity to examine these at intervals and report their condition, in order to have them called in before they are too far gone for re-varnishing. If this system was more frequently adopted, the rolling stock of our roads would be more attractive and the companies would be the gainers.

I cannot lay down a standard rule as to the exact time a car should remain in service before being called in for re-varnishing, but I find as a general rule with the cars on the Michigan Central road, that they should not exceed twelve months' service, and new cars, or those painted from the foundation, should not be allowed to run over ten months the first year. By thus allowing a shorter period the first year, the car will look better and wear longer by this mode of treatment. Cars treated in this way can be kept running for six and seven years without re-painting.

AMERICAN LOCOMOTIVES IN 1884.

THE year 1884 witnessed marked depression in all departments of business, but it is doubtful if any class of manufacturers have experienced want of orders so keenly as those depending on railroad companies for patronage. If railroad managers were permitted to carry on their business in the manner well-managed private firms are conducted, they would take advantage of seasons of depressed trade to prepare their structures and machinery for the heavy traffic of coming busy times, by judicious expenditures, that could then be economically made, when labor and material were cheap. This they are not allowed to do. The tyranny of the stock market compels the majority of railroad managers to stop all expenditures that can possibly be avoided as soon as depression of business intervenes, this unwise course being pursued in order that a slightly better report of net earnings may be obtained. In many cases this policy enormously increases the ultimate expense of operating and repairs.

During last year, the curtail-at-any-expense policy has been dominant, and locomotive-builders have suffered severely from its effects. During the year 1883 seven of the largest locomotive builders turned out 1,346 locomotives, and last year the work done by the same builders was represented by 901 engines, which indicates a falling off of over 33 per cent. There are 16 locomotive-building shops in America, and three of them have ample capacity to construct all the locomotives that were bought by railroad companies last year. The parties who contemplate putting money into new locomotive-works, might find this fact worthy of consideration. Several of the builders have declined to say anything about what they are doing, but ten have given their output, which aggregates 1,001 locomotives great and small. From the data received from railroad shops, there is reason to believe that building new locomotives for themselves has been practiced rather more largely by railroad companies in 1884 than it was in the preceding year. Figures at hand indicate that about 250 locomotives were built in locomotive-shops, and if 20 are allowed for each maker whose output was not obtained—which is a liberal average—the whole production of locomotives in the United States during 1884 is 1,271. About 100 engines in this quantity were for exportation.

The tendency of railroad companies, as indicated by the engines built last year, is to employ heavy locomotives with more than four wheels connected. One builder who put up 73 engines had 16 standard eight-wheel passenger engines, 11 Moguls, 19 ten-wheel engines, 7 consolidation engines, 5 switching engines, 2 mine engines, 1 passenger four-wheel narrow-gage engine, and 12 Mogul narrow-gage engines. This can be accepted as a fair estimate of the locomotives being turned out in other shops. While engines larger than those of the familiar eight-wheel type are in growing demand, there is a decided drop in the percentage of consolidation engines built last year compared to the year before. There is a growing impression among many railroad men, that a ten-wheel, or Mogul engine, can haul all the cars on a tolerably level road that may be safely put in one train, and that heavy consolidation engines are only adapted for working heavy grades. This opinion appears to materialize in the decreased demand for consolidation engines.

A striking feature about the locomotives built last year was the small number of narrow-gage locomotives represented. Narrow-gage railroad companies are feeling the pressure of hard times peculiarly onerous, or they have not faith enough in the stability of the system to increase the rolling-stock that will be useless when standard gage is adopted.

In all quarters master mechanics manifest a desire to increase the economical efficiency of locomotive service, and new engines are equipped with every improvement likely to promote this. Steel for boilers is becoming almost universal, and boilers are being steadily increased in size, and the tendency towards higher pressure goes on. Enlarged heating surface enables engines to be run with enlarged exhaust-nozzles, which reduces the speed

of the gases of combustion, securing increased absorption of the heat. The extended front end is making rapid headway, and in connection with that arrangement many master mechanics are striving to harmonize draft appliances so as to admit of still increasing the exhaust-nozzle opening. Mr. Buchanan, of the New York Central Railroad, is making the smoke-stack casting bell-mouthed and using a single nozzle, his idea being to obtain maximum efficiency of the exhaust steam to promote draft, by making the nozzle and stack conform in principle to an injector. His experience has been very encouraging. Mr. J. M. Foss, superintendent of Central Vermont Railroad, Mr. James Meehan, Cincinnati, New Orleans and Texas Pacific Railway, Mr. R. W. Bushnell, Burlington, Cedar Rapids and Northern Railway, and others, have been laboring in lines of their own to improve the draft appliances, with gratifying results.

Anthracite coal-burning locomotives are on the decrease, for there seems to be a growing impression that bituminous coal can be burned without being offensive on any kind of trains. The practice that came in vogue with hard coal-burning locomotives of placing the fire-box entirely above the frame to secure a wider grate and increased width of fire-box, is receiving considerable application with soft coal-burning engines. The Schenectady Locomotive Works alone built 13 locomotives with the fire-box constructed in this way. If this plan is found to work as well in practice with burning soft coal as it does with hard coal, it seems susceptible of considerable improvement. The boiler could be elevated till its center is about the height of Wootten boilers, which would give fair depth below the tube line. Meehan has elevated his boilers in fast passenger-engines, merely to secure increased steadiness in running, a somewhat anomalous result produced by elevating the center of gravity; and there is no reason why it should not be made the most of when a better fire-box is the object sought.

The desire to improve on the ordinary locomotive boiler has led to several experiments during the year, where novel types were brought into service or radical changes were made on old ones. In June last the Brooks Locomotive Works finished an engine for the Chicago Coventry Locomotive Boiler Company. This engine is of the Brooks eight-wheel standard type, but it has a return-tubular boiler covered by the Coventry patent. The boiler, which is a very large one, being 60 inches diameter at the smallest ring, is divided horizontally into two compartments, both being nearly filled with tubes. In the lower part are 150 two-inch tubes which convey the gases from the fire-box to the smoke-box; and the upper section has 80 three-inch tubes which lead the gases back from the smoke-box to the stack, which is placed on top of fire-box in the position usually occupied by the steam dome. This engine has been running on the Chicago and Northwestern Railway and on the Chicago, Rock Island and Pacific Railway; and the owners claim a substantial saving of fuel.

Mr. A. J. Stevens, general master mechanic of the Central Pacific Railroad, has designed and built a locomotive-boiler with a combustion chamber in the middle of the tube space. Tubes 4 inches diameter lead from the fire-box to the combustion chamber, whence the gases are conveyed by a large number of 1¼-inch tubes to the smoke-box. Mr. Stevens' idea is, that the large tubes which the gases of combustion enter first do not suppress combustion, that the flame which would be immediately extinguished on entering a 2-inch tube keeps burning in the large tube, and the act of combustion is completed in the combustion chamber. The boiler in service has given remarkably good evaporative results, besides throwing no sparks.

Mr. Buchanan, superintendent of motive power and machinery of the New York Central Railroad, has put his water-table fire-box into the greater part of the engines built for the road during the year; and he has improved the combustion by adding pipes for superheating steam which is used to inject air upon the fire.

An examination of improvements effected on locomotives during the year indicates that master mechanics are not entirely contented with the ordinary link motion as a means of distributing steam. Several notable attempts to devise a reversible valve motion, free from the objectionable features of the link motion, have met with practical application. First among these may be placed the Stevens valve-gear. With this motion, one eccentric is used, and the lead is taken from the cross-head. Two slide-valves are employed, one at each end of the cylinder, and they are operated by separate stems which connect with a wrist plate. The leading advantage of the motion is, that when the engine is cutting off short, release can be delayed till close to the end of the stroke. For freight-engines and others with comparatively slow piston speed, the gear is found very economical. Indicator cards taken from engines having this motion, show remarkably small back pressure when release is delayed beyond 90 per cent. of the piston stroke.

Mr. Alexander Mitchell, superintendent of the Lehigh Valley Railroad, fitted up an engine which was built last year with a peculiar valve motion, the invention of Mr. George S. Strong, of Philadelphia. This engine has a steam-jacketed cylinder; and the steam is distributed by means of four independent gridiron-valves that operate vertically on seats at the ends of the cylinders. The steam and exhaust-valves are worked separately, and are so operated that admission, cut-off, exhaust and compression can be regulated for the work the engine is doing. The valve-motion resembles the Joy gear, the movements being taken from the vertical and horizontal action of the main rod. Two reverse levers are employed, which can be used together or separately, as there are two quadrants. The engine met with a serious accident which destroyed one of the cylinders shortly after she was first tried. Owing to this the engine has not done enough work to demonstrate her economical value.

Many master mechanics are improving on the plain slide-valve by adopting the Allen valve, especially for passenger service. Balanced valves of different kinds have also been put on many locomotives during the last year.

Apart from the novel forms of boilers, already mentioned as having been introduced during the year, a few other modifications that entailed changes from ordinary types have been introduced. Mr. Mitchell, of the Lehigh Valley Railroad, the inventor of the consolidation locomotive, has built, for working steep grades, some heavy engines that have eight drivers connected, and a pony truck in front and behind. The arrangement gives

a fine distribution of weight on the drivers, with a rigid wheel-base three feet shorter than would be necessary with a consolidation engine of the same size. The same prolific designer got out a neat and convenient form of double-ended, single-driver locomotive intended for inspection purposes. Mr. Stevens, of the Central Pacific Railroad, has got his long-spoken-of huge "Mastodon" ten-wheel connected engine in service, and she is doing excellent work. Although the wheels are placed so close that the tires nearly touch each other, there is a total driving wheel base of 19 feet 7 inches, but the rigid wheel base is five feet less, which enables the engine to track well on sharp curves.

The Cooke Locomotive Works have built a group of ten-wheel engines for the Elmira, Cortlandt and Northern Railroad, which have the four-wheel truck in front of the cylinders—a style that is very common in Europe, but is a novelty here.

The Mason Locomotive Works, which have been in the habit of building suburban and narrow-gage bogie engines with Walschaert motion, have changed to the link motion. Respecting the business of these works, Mr. Meats, the superintendent, writes: "We have built an unusually small variety of locomotives during the past year, made up almost entirely of the standard type. Of these we have constructed from 18x24 inches, 96-inch drivers, for heavy passenger work, weighing about 100,000 pounds, to 17x22 inches, weighing about 76,000 pounds, and have in process of construction at present some 17x22 inches, with 69-inch drivers, for passenger work, to weigh about 90,000 pounds when in running order. We have also constructed some 17x24 inches, with 63-inch drivers, for mixed service. For passenger work we have wholly used the straight stack and extended arch, some of which have been fitted with a steam-jet to expel the sparks from the smoke-arch, and some have been fitted so as to drop them into the pit. Krupp steel has been used considerably for tires, piston-rods and crank-pins, and in some cases for axles. We are now about to secure truck tires by means of his retaining rings and bolts, on a special order. Steel boilers, according to present indications, will be the rule rather than the exception for new work. Amongst the bogie engines we have constructed, I may mention a 16x24 inches, with 57-inch drivers, weighing 56,000 pounds on drivers and 10,000 pounds on pony truck. This engine, as you would suppose, has developed a high hauling capacity for its size, and excellent results in speed on local passenger work, the chief causes of its success being the free scope for a large grate area and the comparatively small amount of dead weight, together with a minimum resistance upon curves."

The most reliable official figures that can be found show that there are 29,227 locomotives of all kinds belonging to the railroads of North America. Reckoning the life of a locomotive at 25 years, it ought to require the construction of 1,169 locomotives annually to maintain the stock of engines. A great many locomotives kept on the motive-power list are doubtless out of service; but, making free allowance for this, the figures indicate that in the last year the renewals of locomotives have been far below the necessary requirements. Many of the engines built do not represent maintenance of stock, but were called for by new roads and extensions. Renewals must be made some time to fill the blanks left by wear and tear; and those who delay longest in getting their motive-power put in order, will pay heaviest for the work when it can be delayed no longer.—Angus Sinclair in *American Machinist.*

RAILWAY DEVELOPMENT IN CANADA.

MR. WEBB, Locomotive Engineer of the London (Eng.) and Northwestern Railway, stated, at a meeting of the Statistical Society, that last year the engines of that railway ran over forty-five millions of miles, which was about equal to a mile and a half every second of time, or ninety miles a minute, or around the world in every four and a half hours. He also stated that, according to his calculations, every hour throughout the year 14 cwt. of steel disappeared off the rails on that railway through wear. The London and Northwestern system comprises about 1,780 miles.

There are not less than 270,000 miles of railway in operation throughout the world, and the capital invested is fully $20,500,000,000.

Yet the first railway which carried passengers was operated in England in 1825, and was fifty-six miles in length. It was followed by a short line out of Boston, Mass., in 1827, and by the Lyons and St. Etienne Railway in France, opened 1828.

Canada's first passenger railway (there was a coal railway in Nova Scotia before, on which was used one of George Stephenson's original locomotives) was started in 1832, a charter having been in that year granted by the legislature for a railway from Laprairie, on the St. Lawrence, to St. John's on the Richelieu. The length of the line was sixteen miles. The pioneer Canadian line, the official name of which was the St. Lawrence and Champlain Railway, was popularly known at first as the "Snake line," and later as the Caughnawaga Railway, and is the one to which Sir John referred in his recent speech before the liberal-conservative convention in the opera house.

It was first worked with locomotives in 1837; and the first locomotive used was called the "Kitten," whether from its irresponsibility of action or from its liveliness of motion I know not. It was brought from Europe by an engineer, who kept it, when not at work, caged up and secreted from public view, possibly to prevent the over-curious injuring it, and thus stopping the whole railway traffic of Canada. The next imported was called the "James Ferrier," I presume after the present Senator Ferrier, whose earnest face is still to be seen in the railway committee of the commons whenever any bill affecting the Grand Trunk Railway's interests is up for repair in that great work-shop of the commons of Canada.

The capital of the St. Lawrence and Lake Champlain Railway was $200,000.

The summer travel to New York from Montreal passed entirely through the Champlain canal in passenger-boats drawn by horses—a fact which may explain the early construction of the St. Lawrence and Champlain Railway, which in those days ceased to run when navigation closed and the Lake Champlain steamers ceased to ply.

The first railway return presented to the legislature of the province of Canada was the return made by this railway in 1844. That return gives the following facts con-

cerning our first railway: No. of miles in operation, 16; No. of passengers in the year, 27,118; No. of tons freight carried, 12,636; Gross receipts for year, £15,230; Expenditure, £11,851.

Since his public career began, Sir John McDonald has seen the sixteen miles grow to nearly 10,000 miles; the modest $200,000 invested in railways become fully five hundred million dollars; the passengers carried increased (in 1883) to 9,580,000; the tonnage of freight handled expand to 13,266,255 tons (in 1883); the total year's receipts develop from $75,000 to $38,244,585, and the total year's expenditure reach the sum of $24,400,000. The solitary "kitten" that playfully tumbled between St. John's and Laprairie is now represented by 1,358 of a locomotive progeny.

The total receipts by the railways of Canada in 1883 were within $300,000 of the aggregate trade exports and imports of the four provinces of Upper and Lower Canada, New Brunswick, and Nova Scotia, and Prince Edward's Island in 1844.

A glance at the map will show how well the peninsula of Ontario has been plowed up by the network of railways which, if it has spoiled some picturesque scenery, gives employment the world over to close upon a million employés. The Ontario peninsula is as well networked with railways as any part of the continent, and passage is easy and rapid between the chief towns of all Canada. Yet a generation has not passed away since representatives from Toronto and west of the Queen City wanting to attend legislative duties in Quebec after navigation closed, found that their best and quickest route was to go to Buffalo and take train along the south of Lake Ontario, and thence to the Citadel city.

The sister province of Quebec had not made as rapid progress as Ontario up to the time of confederation, when (in 1866) the province of Canada had 1,968 miles of railway, 1,393 of which were in Upper and 575 in Lower Canada. But she has made good progress since then, and in 1883 had as many miles as Upper and Lower Canada together in 1866, while the total completed and projected in that province amounted to 3,900 miles.

Taking the railway development of Canada as a whole, we find that since the confederation year the growth has been rapid.

From 1868 to 1878 the traffic receipts increased at the rate of $902,000 a year.

From 1878 to 1883 the traffic receipts increased at the rate of $2,544,900 a year.

From 1868 to 1878 the number of passengers carried increased at the rate of 352,392 a year.

From 1878 to 1883 the number of passengers carried increased at the rate of 627,200 a year.

From 1868 to 1878 the tons of freight carried increased at the rate of 562,347 tons a year.

From 1878 to 1883 the tons of freight carried increased at the annual rate of 1,078,557 tons.

From 1868 to 1878 the capital invested in railways increased at the annual rate of $17,821,218.

From 1878 to 1883 the capital so invested increased at the rate of $31,532,000 a year.

It may be well to note that the increase of late years has been even more rapid in the middle period since confederation. During the years 1875, '76, '77 and '78, four years, the tons of freight carried on our forty-eight or fifty railways amounted to 26,265,441 tons, or an average per annum of 6,566,360 tons.

During the period 1879, '80, '81, '82 and '83, five years, the tons carried were 48,846,233, or an average per annum of 12,211,560 tons.

The increase of 1878 over 1875 was 2,793,056 tons. The increase of 1882 over 1878 was 5,382,793 tons.—*Montreal Gazette.*

TICKET COMMISSIONS.

THE question of ticket commissions is one of the most important that can come before railway men for determination. The magnitude and extent of the evil and the numbers and power of those whom self-interest makes its friends, are alarming features. Sooner or later the task of suppression must be undertaken and, if once boldly grappled with, the issue is not uncertain. Believing the present a most auspicious time for undertaking the good work of abolishing this pernicious practice, we have persistently urged railway men to unite and begin the fight.

The great objections to the practice of paying commissions are its expensiveness, its uselessness and its demoralizing tendencies.

In his circular, calling a meeting of the representatives of railways in the Southern and Western Associations to consider this subject, Mr. S. F. Pierson, Assistant Commissioner of the Trunk Line Pool, gives some facts showing the startling proportions of ticket commissions. He states that the amount thus paid out "has become a severe tax upon the revenues of the railways. This tax is stated by a number of roads to be not less than 20 per cent. of their entire receipts from competitive passenger traffic, while some roads estimate it to be much higher, and there are individual cases where the commission is equal to 46 per cent. of the receipts from the business upon which it is paid." He further says that it is thought "that no legitimate business ought to endure such a drain upon its revenues to secure at best, in many cases, only an unstable neutrality."

From paying commissions at a few important offices, the practice has increased, until in large cities scores of brokers are paid disproportionate percentages and the agents in every small town receive a stated amount on each through ticket, in addition to the gratuities or cap commissions given his subordinate in charge of the local office. In order to secure his fee the agent is often induced to discriminate against the road employing him, and send travel over competing lines. Every important road keeps from four to ten, or more, traveling passenger-agents whose business it is to go from office to office and coddle, bribe or otherwise cajole the local ticket-agents.

The practice is practically useless. If every road pays the same commission on the same kind of tickets, wherein are any profited? In order to persuade the agent to discriminate he must receive special inducements from one company; this, when discovered, leads to a rise on the part of the others and so all are constantly bidding against each other and conducting secret consultations with the ticket-seller, the effect of which is to constantly advance this kind of compensation. It may be alleged that the ability to pay ticket commissions is a club in the hands of

small and weak roads, whereby they can force older roads to give them a proper share in the business when pooled. Admittting that this is true, is not the same advantage to be obtained by means of differential rates?

The demoralizing tendencies of paying ticket commissions are many, and most of them are so irritating and hateful that it is hard to understand why they have been endured so long. We have stated that one effect of ticket commissions is to induce local agents to discriminate against their employers. For example, the agent of the Michigan Central at Kalamazoo sells a ticket from that place to Buffalo, over the Central to Detroit and the Grand Trunk from Detroit to destination, in order to get the one or two dollars commission paid by the latter road. This sort of action is very common and is provoking as well as dishonest. The confidential nature of the ticket commission business and the difficulty of finding out just what each road does actually pay, lead traveling representatives to offer percentages not sanctioned by the agreements of their roads and those competing with them. The only way a General Ticket Agent can discover this fact is by noticing the falling off in the sales of his tickets at certain points.

Paying commissions gives local agents the dangerous powers which some of them are apt to exercise. One of these is the ability to cut rates and secure the business by a division of his commission, but the more pernicious is the temptation to make insolent demands upon roads for an increase of the commissions allowed him. Suppose that these demands are acceded to, in time new ones will be made: if the action of the agent is reported to his employer and a discharge follows, then the discharged employé, when he drifts to a similar employment with another road, naturally revenges himself upon the road reporting and the one discharging him. In either event loss results.

Ticket commissions are the life of the scalpers. None are simple enough to suppose that these brokers thrive by buying and selling tickets purchased by travelers at regular offices; their stock comes from the general ticket offices, with the heads of which they are on intimate terms. If rates are to be cut, a nod does the work, or, when an apparent good faith is to be maintained, the same result is attained by allowing a commission sufficient to enable the scalper to divide with the purchaser and thereby sell at less than regular rates. This sort of business is unfair to the public as well as unjust to competing roads.

Nearly all railway wars have originated in the trickery of passenger agents who, to secure a few more passengers, have paid enormous commissions or resorted to underhand dealings with scalpers. If these ticket commissions could be abolished, scalping offices would be compelled to shut up and then, if a thorough system of pooling and differential rates were to be adopted, there would be no motive for cutting rates, and such action would never be tolerated.

How can ticket commissions be abolished? We can suggest a plan. Let the trunk lines of the country resolve to discontinue the practice, and then honestly carry out their resolution. If the large systems were to take this step the smaller lines would soon swing into line, and the result would be an accomplishment of the hopes so long entertained. In cases where justice demanded it, proper differential rates could be allowed.

The greatest obstacle to the adoption of this plan is the mutual distrust of the representatives of the lines interested. Each fears that the agreement would only tempt some one of his rivals to send out men on the sly to offer commissions on the sale of his tickets, and thus the only effect would be to aggravate the ticket-agents and scalpers and excite hostility, without producing any lasting beneficial results.

This objection should not prevail. If General Passenger Agents cannot be made to keep their word, they ought to be dismissed; we are loth, however, to believe this imputation upon their honor, although we know a few who, being naturally cunning and knavish, would surely violate pledges, unless their General Managers interfered.—*Railway Register.*

"FREE PASSES."

WHEN the critics enumerate the sins and follies which they say characterize the management of railways, in this country particularly, they place prominent in the category the practice of issuing free passes—that is, unless they happen to be recipients of passes themselves. Even in the elaborate and generally fair report of the government directors of the Union Pacific Railway, the subject is referred to as follows:

"The Union Pacific has the reputation of being exceptionally conservative in the matter of granting free passes. A statement of those issued during the year last past—'trip' passes only, and not including 'annuals'—shows that the lowest one week's issue was $13,772 and the highest $21,452. The computation is upon the basis of the regular passenger tariff rates. Measures to correct are demanded, and, it is gratifying to say, have been inaugurated."

The inference from these figures of course is that the railway named is giving away every week from $13,722 to $21,452 of its revenue in the form of free passes. When it is remembered, however, that a very large part of the traveling done on these passes would not have been done without them, it will at once be seen that the figures are misleading and of little real significance. Only so far as the passes were used by persons who would otherwise have paid their fare do they affect the company's revenue, as the same trains and the same number of cars would be run if there were no "dead-heads" at all. The object of this article is not to advocate the free-pass system, but to defend railway officers from unjust criticism in this respect, by showing some of the reasons and influences which impel the railways to bestow the privilege of free transportation. Two of the most potent of these influences are suggested, unintentionally, in the report just referred to, by the following sentences immediately after the words above quoted: "It is within the knowledge of the government directors that the president and general manager recognize the necessity of popularizing the road so far as they may, though the obstacles in the way are numerous. It is a constant fear of adverse legislation on the one hand, and the constant determination on the part of the public to have remedial legislation on the other, that tends to render railway securities of uncertain value, the operation of roads uncertain of success and greatly increased in difficulty to their management."

"The constant fear of adverse legislation" is—it may

as well be admitted—the reason for the existence of a very large share of the free passes that are issued. It is a notorious fact that the most persistent and extravagant demands for passes come from men holding political offices, from aldermen and town, city and county employés of every grade, up to State and national legislators and officers. Here is where the clamor and threats of demagogues against railways come into advantageous use. Every office-holder and office hanger-on, from little to big, knows that the railways have been placed absolutely at the mercy of the lawmakers, and that the most monstrous exercise of legislative power in fixing rates, even to the robbing of railway owners of all return whatever upon their investments, must be submitted to, even without the possibility of appeal to the courts. Knowing, therefore, that the railways fear their enmity and will not dare to refuse their requests, the politicians use their power to obtain transportation for themselves, their families, their friends and often their business acquaintances, and railway managers submit to this species of blackmailing because they feel that they must. Occasionally laws have been proposed—but not passed—making it a crime for railways to give passes to any public officers. This is beginning at the wrong end. Laws forbidding public officers and servants to accept or use free transportation on any railway, would take the burden from the railway officers, who now act under a species of compulsion, and place it where it belongs—upon the men whose power to secure passes rests solely on the fact that they are, in some way, representatives of the terrors of the law. It would be an immense relief to railway managers if the responsibility of incurring the enmity of the office-holding class could thus be taken from them, but it is safe to say that the recipients of passes will not be likely to enact laws prohibiting the further enjoyment of one of the most prized perquisites of political life.

"The necessity of popularizing the road," to which the governmental directors allude, is another strong reason for the giving of free transportation, especially where competition exists—as it now does almost everywhere. The railways depend on the public for their business, and their officers have to exert themselves in every way to secure the public favor, through the press, through large shippers and through other influential men. Hence, while the giving of passes to "popularize the road" and increase its business has been carried, often, to a deplorable extent by the railways as a whole, still it is for each manager to determine whether or not it "pays" in his own case—that is, whether he gets more business and more profit in the end by giving passes than he would have got if he had refused to give them. Happily, of late, competing lines have made and, to a large extent, lived up to agreements not to issue passes to influence freight business, and thus the pass evil has already been diminished to a considerable extent.

Transportation given to the newspaper press hardly should come under the head "free," for, as a rule, more than an equivalent is rendered for it. The influence of the local press in aiding the organization and construction of railways, and in making their advantages and facilities known to the public after they are set in operation, is hard to measure. Even here, however, there is of course opportunity for imposition and unnecessary annoyance, but on the whole it is not likely that the railways lose any money by being liberal in the matter of transportation to the press. In the case of newspaper men, perhaps even more than in that of politicians, it should be remembered that a very small part of the traveling indicated by passes would be indulged in if it cost money.

"Exchange passes" to other railways form a very large percentage of the total number of annuals, and trip passes to officers and employés of other roads are also numerous. These are ordinary business courtesies for which the recipients are supposed to, and as a rule do, reciprocate. Generally they are issued to those who are obliged to travel on other roads on business for their own companies, and so they save each company from cash expenditure on this account. In other words, the roads pay each other for transportation in kind, instead of in money—a mutually convenient and economical operation. Under this head should be mentioned the passes issued by all roads to the ticket agents of other roads almost without limit, in order to secure the good will or, at least, neutrality of these agents who, by reason of their direct contact with the traveling public, are supposed to be potent for good or ill toward any road. This variety of pass-giving savors very much of that to politicians and office-holders—a compulsory rather than a spontaneous giving, to avert evil rather than to secure good. Nevertheless it is sanctioned by custom and perpetuated by competition, and until all the railways effect some binding agreement with each other in this regard, it is useless to criticise their officers for adopting the same methods for securing business which their competitors employ.

Charitable, benevolent, religious and public-spirited objects demand and secure an amount of free transportation from the railways which would aggregate an enormous sum every year, if computed at its actual money value. The disposition to find fault with the railways has become so general that very little credit is given them for this kind of work which they are, nevertheless, constantly called upon to do, and which they do most generously. If the giving of free transportation were absolutely prohibited, as some have proposed, public and private benevolence would be very heavily taxed to pay the railways for transportation now voluntarily and liberally given. Let the recording angel make a note of this to the credit of these corporations, which are popularly said to have no souls.

Other varieties of claims for free transportation might be named, but the foregoing will suffice to suggest some of the reasons why the practice of issuing free passes, which is often so fiercely and unreasonably denounced, continues to exist, and also to show some of the embarrassments which surround railway officers in attempting to control and diminish what, if an evil, is at least an evil with many and great mitigations.—*Railway Age.*

IT was at a railway station. The trains were being made up. Puff went the locomotives, whirr went the wheels, and the whistling was terrific. They were backing and forwarding and all manner of shunting on a labyrinth of rails. "What are they doing?" "Practicing for an accident!"

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A STEADY IMPROVEMENT.

IT is a pardonable source of pleasure to us that our efforts to conduct the JOURNAL as a monthly railway magazine and review have met with a cordial recognition, and that the character of its contents has been uniformly commended. With the present issue—the ninth since the change in management and policy—we publish four more original contributions, making a total of thirty-eight during the period. But on this occasion we take a special pride in calling attention to the nature of these contributions. The four published this month, we are prepared to submit not only as an exponent of the future character of the JOURNAL, but also as an indication of the steady improvement manifested in our contributors' department, which improvement, we trust, will continue indefinitely.

We are fully aware that the past year has not been a favorable period for attempting new features in journalism, nor has the condition of the railway industry been such that rapid success awaited well-directed efforts in behalf of the interests involved, but none the less has our endeavor to establish a railway magazine and review met with encouraging results, and we are content to bide our time for a still greater appreciation of the value of the JOURNAL. In this connection we may again say that in two ways we can never be over-supplied—with able contributions on railway topics, or subscribers. The former may look for liberal remuneration for their literary efforts, and the latter for an adequate *quid pro quo* in the monthly receipt of the JOURNAL.

RAILWAY LEGISLATION.

MORE than once have we had occasion to comment upon the unfair treatment of railway interests in our national and State legislatures, and doubtless the subject would be threadbare were it not for the uncertainty always existing as to the quarter from which the next attack on railways might be expected. The frequency of these attacks and their usual abortiveness render them to some degree comparatively harmless, but the continual subjection of railways to a position of defence, greatly harasses railway progress, and discourages the capitalist from railway investment.

It may be admitted that on various occasions railways have influenced legislation, and that bribery of legislators in the interests of railways is a not uncommon occurrence; but it may be truthfully said that this bribery, in nine cases out of ten, is a species of blackmail wrung from the treasury of the roads by smart and unprincipled members of legislative bodies. Were it not for the uncalled-for attacks upon railway interests, unjust and burdensome taxation and unwarranted interference with the conduct and

management of railways, the corporations would be perfectly willing to avoid the legislatures, save on such occasions when they might rightfully endeavor to obtain certain concessions and privileges. Anti-monopolists are all very well in their way, but it would be a pleasing spectacle to see them, for once, divert their energetic philippics from railway and kindred interests, and attack the greatest of all monopolies—the monopoly of bribery—which is at present controlled by our legislators.

Far be it from us to insinuate that every measure designed to limit and abridge the privileges of railways emanates from a desire to extort money from their coffers. There are doubtless many honest and well-meaning men who think they are pursuing the strict path of duty when they direct their endeavors in anti-railway channels, but from a utilitarian point of view, their honest thick-headedness is quite as harmful, if not more so, than the roguery of their smarter colleagues. It matters little whether it is from ignorance or dishonesty that railways are forced to battle for their privileges; the struggle between corporations and individual legislators inevitably redounds to the evil of the former, even though they gain a temporary victory, and the right or wrong position of the corporation has but little effect upon this result. The constant defensive attitude of a corporation puts it much in the light of an unfortunate man who is, through the force of circumstances, brought frequently before a court to clear himself of charges of which he is innocent. His innocence may be infallibly proven on every occasion, but his constant appearance in the defensive, while at first arousing sympathy will eventually awaken prejudice. And while railways and other corporate industries may successfully resist injustice, a time comes when the frequency of their defence will tend to prejudice the public mind against them, on the ground that such constant appearance must indicate a weakness in their case. If we are not mistaken this prejudice has already arisen, and it will require greater exertion to dissipate it than it did to create it.

Possibly some comfort may be drawn from the reflection that these attacks on railways are an indication of the peace and prosperity of our country, inasmuch as they tend to prove that our legislators are at a loss to find weighty grievances on which to legislate. They are paid salaries and must needs render service in return, and therefore the railways are seized upon as legitimate game. The village Solon, with aspirations toward office and attendant honors, sees a cheap glory to be obtained in fighting the railways and thus proving his "incorruptibility"—until the railway stops his mouth in sheer self-defence, and then he is most likely to do greater harm to the corporation in posing as a corruptionist. It is safe to say that the railways would only be too willing to dispense with "friendly" legislators, if they could do so with the certainty that the latter would remain neutral. The difficulty is that in the mind of the average lawmaker, there is no middle ground where railways are concerned; they must either be pro or anti-railway men, and they will be either for a price. In the one case the price is cheap fame, in the other hard cash, and the hard cash will carry the day every time—if there is only enough of it.

It does not seem much to ask that railways may be treated as individuals, which their corporate charter demands, but how often do they figure in this light? In a straight hand-to-hand encounter between a railway and a legislature, putting aside all question of undue influence, how often will the corporation be as justly treated as would a single individual? The railway is regarded as a species of legislative foot-ball, fired from one side to the other and treated with no great degree of gentleness, but if it amuses the players and allows them to make "scores" no one complains—unless it be the railway itself, and its complaint would only be regarded as an indication of its corrupt nature. This legislative foot-ball is a great game for everybody but the ball.

DISCRIMINATION BETWEEN PASSENGERS AND FREIGHT.

THE two branches of railway traffic, passenger and freight, differ widely. While the questions of mileage and competition enter into the consideration of both, they must be viewed from entirely different standpoints as revenue-producing items. It requires little discernment to understand that the cost of transporting passengers is relatively much greater than in the case of freight; and no one will argue that because freight can be transported for a fraction of a cent per mile on every hundred pounds, passengers should be carried at the same rate. The railway equipment, the rolling-stock necessary to the transportation of passengers, and the attendant train-service, are far more costly to construct and maintain than the similar equipment for freight-carriage, and naturally the transportation of passengers is conducted at higher rates than freight, if it is to be conducted at a profit. This much is clear and calls for no explanation.

But to the average traveler this disproportion of rates may seem greater than is warranted by the actual difference between the relative cost of passenger and freight transportation, and were there no other questions involved than the simple difference in the cost of equipping and maintaining the passenger and freight "plants," such objections and complaints would be justly founded. In reality there are more cogent reasons than this why the disproportion should be great. It matters little whether the freight or passenger traffic of any one particular road is the greater source of revenue; the latter may even be conducted at a positive loss. Nevertheless the freight traffic must always be subordinate to the passenger traffic.

If there are delays in the running of trains and consequent detentions, the first considerations must be for the passenger trains. The freight may be of a perishable character, but if one or two trains of either class must be detained on a siding for several hours it must be the freight train, even though the passenger train may contain but a handful of passengers. To give this precedence to one class of traffic naturally increases the cost of conducting this branch to a considerable extent. Again, the requirements of freight traffic are far less pressing than those of passenger traffic. Even in the transportation of freight between two great cities the actual number of daily trains run will not exceed one or a few at the outside. Instead of running, as in the case of passenger traffic, a dozen or twenty trains a day of a few cars each, a freight train may consist of a great number of cars drawn with but a single engine, and costing scarcely more for its transportation that would a train of a few cars. In no case does the maintenance of freight traffic call for a greater number of trains than the actual bulk of freight demands, yet a road that conveyed passengers on this principle would be rightly subjected to criticism. Passenger trains must be run, not so much with a view to the actual number of passengers carried, but to the requirements of these passengers, whether they be few or many. A number of trains, even on trunk lines, are run at an actual loss in order to afford the necessary train accommodation to the patrons of the road, and for this action on the part of the railways the public are rarely grateful and generally clamor for still greater accommodation.

In order to convey travelers safely and comfortably, the road-bed must be kept in perfect order, and the items of track-construction and repairing reach large amounts. The maintenance of passenger stations with their lighting and heating, to say nothing of the cost of construction, are burdensome and permanent sources of expense; and the employment of the necessary working force incidental to passenger traffic is a far greater item of expense than that attendant upon the employment of freight-hands. The maintenance of schedule time in passenger trains, the frequent changes in time-tables, even the comparatively small items of printing and stationery, tend to increase the disproportion of the relative expenses, and while it is perhaps difficult to estimate upon the exact proportional difference between the actual cost of passenger and freight traffic, it is easy to comprehend that this disproportion is very great.

The public are fond of grumbling, and they have exercised their powers in this direction ever since railway travel became a successful and established achievement; but while in many instances there may be just ground of complaint against railways, in general they are founded on no grounds at all. More especially is this true when we consider the perpetual cry for lower rates of fare, which is made irrespective of the cost of conveyance to the roads themselves. When we reflect that but a little more than a half-century ago the only means of extended travel was by cumbersome stage-coaches traveling at a snail's pace and charging rates per mile that the most grasping and unscrupulous railway management would blush to mention, we are seized with a mild wonderment at the unreasonable and exacting nature of the average traveler. In his own lifetime he has seen a wonderful change in traveling methods, and at one-half and one-quarter the expense he may travel in one-tenth the time, a distance that fifty years ago was considered an extended journey. Nevertheless he is not satisfied and clamors for greater speed and cheaper fares. Grumbling is a national institution we are fully aware, but we honestly believe that if the average grumbler would quietly reflect upon the manifold blessings conferred by the nineteenth century upon its children, he would concede preëminence to railways and conclude that he had far less cause for complaint than for thankfulness.

EDITORIAL NOTES.

THE *Wall Street Daily News*, a bright financial daily paper of this city, has been indulging in an attack upon some questionable operations of Messrs. GOULD and FIELD, and these gentlemen have nobly retaliated by shutting off the *News* from sale at the stations of the elevated roads. We do not feel called upon to extend our commiseration to the publishers of the *News*, for they are rather in a position to accept congratulations. When such mighty men as Messrs. GOULD and FIELD disturb themselves sufficiently to attempt to "squelch" anybody, the "squelchee" generally acquires a most enviable notoriety and popularity. No doubt these influential personages would like to shut off every publication that animadverts upon their methods from sale at the elevated stations, were they not refrained by the certainty that by so doing the patrons of their roads would be left with but a meager supply of reading matter.

* * *

NEW JERSEY has finally realized that a State tax may be necessary. For many years she has thrived and flourished upon the taxes levied upon her railways, but her requirements increase faster than the railways' taxable property. It is a shame that the State should be permitted to bleed its citizens, while the grasping roads have yet a little blood, but it is comforting to know that new plans have been started for a further raid upon the railways. Not often are they allowed to rest in peaceful security.

* * *

THE REAGAN Inter-State Commerce Bill, over whose provisions the country has been greatly interested, and whose unjust discriminations have awakened wide-spread

condemnation, has died a peaceful death in the Senate, and a juster bill has been brought forward instead. Once in a while a bill like the Inter-State Commerce Bill will accomplish some good, in showing the absurdities of legislation that will creep in during a session of Congress; but beyond this the warm debate expended on the bill has gone for naught. Still, that is but a small matter. Perhaps it wasn't worth much.

* * *

IT must be borne in mind that Congress has but twenty-two subjects on which to legislate, and sometimes the supply of legislative material runs dry. The tariff is a ticklish subject, and so is the silver coinage. There is a natural aversion to passing appropriation bills all the time, and once in a while some legislative diversion must be had. The REAGAN bill was an instance.

* * *

HAVING obtained what is considered more reasonable appraisement in New York City, the elevated roads have returned to their former headquarters, but it seems as if their recent *coup d' etat* may not result as satisfactorily as expected. Having for a portion of the year been located in Westchester county, it is now claimed that they are liable to taxation in that county, thus subjecting them to a double tax. There may be too much cleverness occasionally.

* * *

THE New York Stock Exchange is highly indignant because the Mining Exchange has announced its intention of dealing in stocks and bonds in small quantities. Fortunately the prosperity of the country is in no way involved in the differences between these two highly respectable organizations, and the public at large is supremely indifferent. Wall street has "lost its grip," so to speak, and is not liable to regain it for many years to come, a fact by no means to be deplored, save by the "street."

* * *

THERE really does appear to be an awakening of trade and commerce, and despite the dull forebodings with which the present year was ushered in, the advent of Spring may see a general revival. Over-production, which seems to be universally admitted as the cause of the present depression, is a serious evil, but of all causes of depression it is briefest in its effects.

Wanted.

A LIBERAL price will be paid for Vol. XIII of the AMERICAN RAILROAD JOURNAL, and also for volumes from Vol. XVI inclusive, to date. Single copies are also wanted for October 8, 1881, October 15, 1881, January 14, 1882, and June 30, 1882. Please address this office for terms.

Grease and Grease-Cups.

[COMMUNICATED.]

Editor American Railroad Journal:

DEAR SIR:—Replying to an article in your paper on Grease and Grease-Cups, we would call your attention to the following, taken from the *Wood-Worker*, of Indianapolis:

"Last month we reprinted an article from the AMERICAN RAILROAD JOURNAL on automatic lubricators, oils, grease and grease-cups. The article stated that grease and grease-cups could not be a success, because they depended for their operation upon the frictional heat of the bearing to be lubricated being sufficient to melt the grease, before it would cover the parts in fractional contact; and that, as heat in metals means expansion, the bearing was very liable to be injured. This statement brought Mr. Ed. Byrkit, superintendent of Coburn & Jones' planing-mill, this city, to our office, with the statement that he had found a grease and cup for feeding it, that not only did not depend upon frictional heat for its operation, but was open to no objection whatever that he could observe. He has run it several days on an eight-inch box on a large planer, using only one cup, and it had required little or no attention and kept the box and spindle in excellent shape.

"The cup and lubricant are made by a Milwaukee firm. Mr. Byrkit informed us that several other firms in this city had placed them on high speed wood-working machines with equal success. We had always held the same opinion as the writer of the article referred to, but must, of course, be convinced by such practical illustration that such opinion was incorrect."

We supposed that the prejudice heretofore existing regarding the use of lubricants, had been entirely overcome, but it seems there are still a few that doubt. Yours respectfully,

WADHAMS, MAGIE & CO.

MILWAUKEE, WIS.

[We forwarded the above communication to Mr. E. F. Dieterichs, the author of the original article published in the AMERICAN RAILROAD JOURNAL, and he sends us the following in reply.—ED.]

Editor American Railroad Journal:

DEAR SIR:—In the article, Grease and Grease-Cups, published in the *Wood-Worker* and sent to you by a correspondent, the publisher says, that in an article reprinted by the *Wood-Worker* from the AMERICAN RAILROAD JOURNAL the following statement had been made:

"That grease and grease-cups could not be a success, because they depended for their operation upon the frictional heat of the bearing to be lubricated being sufficient to melt the grease before it would cover the parts in frictional contact, and that as heat in metals means expansion, the bearing was very liable to be injured."

That this statement brought the superintendent of a planing-mill to the office who stated that he had found a grease and cup for feeding it, that not only did not depend upon frictional heat for its operation, but was open to no objection whatever that he could observe. He had run it several days on an eight-inch box on a planer, using only one cup and it had required little or no attention and kept the box and spindle in excellent shape, and that other firms had placed them on high speed wood-working machines with equal success.

This is followed by the remark: "We had always held the same opinion as the writer of the article referred to, but must of course be convinced by such practical illustration that such opinion was incorrect."

If *Wood-Worker's* opinion had really always been the same as that of the writer of the article on "Lubricating and Lubricants," it would not have been so easily changed by those so-called convincing practical illustrations. If I had allowed my opinion to be changed as easily, I would have been obliged to change it very often, and finally retire behind no opinion at all, long ago. I have frequently had occasion to notice that intelligent mechanics, after a short and injudicious trial and hasty observation would condemn a grease or oil, which a like number of equally capable mechanics claimed to be lubricants of best quality, and adopt the very kind of lubricant after some time when convinced of their error. Thus are opinions rashly formed.

Much depends on the quality of grease or oil, and the efficiency of the cups to suit peculiar characteristics. To determine their respective efficiency and real value requires intelligent and patient observation, and injury caused to machinery or bearings would have to be of the grossest character to be perceptible to observation in so short a space of time.

The statement that grease used on a bearing did not depend upon frictional heat to enable it to lubricate is only a statement, but no proof. It would be a sorry matter if the heat produced and required to liquefy the grease were to be so formidable as to be perceptible without closer observation. Grease has to depend on an increase of temperature to limpify sufficiently to diffuse itself through a central feed-hole and all over an eight-inch bearing, to equal oil already limpid when applied. Grease can be and is used to great advantage in many cases, but it is erroneous to

claim its merits as a universal lubricant equal or in preference to oils. The articles on "Lubricating and Lubricants" published in the JOURNAL, have a bearing to each other and should not be judged separately.

As to the closing remark of your correspondent's communication:

"We supposed that the prejudice heretofore existing regarding the use of lubricants have been entirely overcome, but it seems there are still a few that doubt."

I am at a loss to understand the meaning, unless complaint is intended thereby over some one's prejudice against some particular lubricant, grease and cup, of somebody's selling or manufacture, as most assuredly no part of my writings on "Lubricating and Lubricants" could be construed by anyone as indicating prejudice or doubt on my part as to the using of lubricants, which, on the contrary, I consider to be indispensable; and I have always most emphatically claimed that lubricating is one of the most important factors in manufacturing and railroading.

Very truly yours, E. F. DIETERICHS.

CLEVELAND, O.

THE Steelton *Reporter* of January 31st says of the Pennsylvania Steel Works: "All the departments of the Pennsylvania Steel Works were in full operation this week. The Bessemer mill last week produced 3,535 tons of steel ingots. The rail mill last week turned out 2,305 tons of various patterns of rails. The mill this week was on 70s. sec. 46; 60s. sec. 5, and changed rolls yesterday to 80s. street-car rails. The frog, switch and interlocking departments are very busy, and orders are being booked every day. The work on the system at Relay, on the Baltimore & Ohio Railway, is progressing very rapidly. The problems presented in devising the locks of the interlocking mechanism required for this system were as difficult as ever presented, but have been satisfactorily overcome by Capt. A. G. Cummings, the engineer of interlocking appliances, and it is probable that this apparatus will be examined with great interest by persons interested in the science of interlocking. This department is working part of their forces at nights on hurried orders. Two new planing machines were lately put in operation in the frog department, which are very handsome and first-class machines. The merchant mill this week has been running 25 and 30 pound rails on the 20-inch train, and 2⅛ rounds on the 13-inch train. Mr. Marshbank, who had the contract for putting in the heating apparatus at the government buildings in Washington city, says that the pipes cast by the Pennsylvania Steel Company were the most perfect castings he ever handled; not a blemish or a misfit was found in the entire lot of pipe furnished."

THE maxim that "the best time to engage in any business is when things are at their worst" has been illustrated by the great Patent and Enameled Leather Works of E. H. Reynolds & Co., Newark, N. J. This eminently successful house was established in 1836 under the firm name of Jos. Ward & Co., and through all the mutations of nearly fifty years has held its place at the head of its line of specialties. It was the first house to cater to the wants of upholsterers in patent leather, and for more than thirty years has enjoyed extensive patronage from that trade. Railways and car-builders have been among its best customers, and no firm in the country is more firmly entrenched in the esteem and confidence of its correspondents. Messrs. E. H. Reynolds & Co. are prepared to take orders of any magnitude, and have facilities for executing the same. Visitors are always welcome at their large establishment in Spring st., Newark, where they will be given every opportunity to inspect thoroughly the work of this well-known house whose age is a guarantee of its reliability.

Japanese Railways.

THE total number of miles of railways now in actual operation in the Japanese empire is estimated at about 260, the most important of which are these: From Tokio to Yokohama, 18 miles; from Kobe to Otsu, 60 miles; from Nagahama to Sekigahara, 10 miles; from Nagahama to Tsuruga, 25 miles; from Tokio to Tagasaki, 75 miles. All these, save the last mentioned, belong to the government, and are under the superintendence of the imperial railway department. There are also fifty-six miles in Hokkaido, in Yezo, and a few miles at the Kamaishi iron works. The line from Tokio to Tagasaki, which has been recently opened to the public, belongs to Nippon Tekiodoguaisha (Imperial Japanese railway company), and the work of constructing the track and the general management of the traffic were and still are entirely in the hands of government employés, the company being only the paymaster. So far as the general traffic management and the number of persons employed are concerned, the company has absolute authority to make restrictions; but in its present state of infancy the assistance of the government is questionably a necessity. The mutual agreement between the shareholders and the government is, that in case of the railway not paying 8 per cent. interest per annum, the latter should make up the deficiency, whatever it might be. In February, after the line had been opened 157 days, the company entered into close calculations, and found that they had earned at the rate of 12.-537 per cent. per annum, and thus needed no assistance from the government.

Both the government and company lines are built on the gage of three feet six inches, which is the standard gage of Japan. The road at Kamaishi Mines is built on a two foot nine inch gage. The longest tunnel in Japan pierces Mount Yanagure (Nanagure Yama) between the provinces of Nagahama and Tsuruga, and is 1,390 yards in length. The tunnel was cut through on the 16th of November last, after five years' work, and the bricklaying is expected to be finished some time this Summer. The sharpest curve is twenty chains, or 1,320 feet, and the heaviest gradient rises one foot in forty. The ties are mostly of chestnut, laid at a distance of two feet nine inches apart, with the exception of the joints, where they are laid two feet apart. The iron rails, imported from England, weigh sixty pounds a yard, and the steel rails, which at the present time are principally used, weigh sixty-one pounds a yard. The Tokio and Yokohama line is built of double-headed rails; almost all the rest are flat-bottomed and fish-fluted at the joints.

Classification of Cars.

THE Cincinnati *Times-Star* says: There are more different cars on the tracks to-day than one supposes. The following list is nearly perfect, and will prove quite satisfactory:

Passenger Line.—Common cars, smoking-cars, sleeping-cars, Pullman cars, Wagner cars, Woodruff cars, Mann boudoir-cars, buffet-cars, Leighton cars, Leve & Alden cars, Southern sleeper, Worcester cars, palace-cars, dining-cars, parlor-cars, hotel-cars, president's car, vice-president's car, directors' car, private car, superintendent's car, in-

spection-car, reclining-chair-cars, emigrant-car, combination car, hermaphrodite cars, observation-car.

Baggage Department—Baggage-cars, mail-cars, postal-cars, express-cars.

Freight Department—Circus cars, theatrical cars, gondola-cars, coal-car, lumber-car, grain-car, cattle-car, hog-car, sheep-car, chicken-car, stone-car, dirt-car, gravel-car, construction-car, tool-car, bridge-car, way-car, flat-car, freight-car, caboose (conductor's office) freight, meat, or refrigerator-cars.

The best car on the road is the "p-a-y car."

The Mersey Railway.

THE whole length of the tunnel under the river Mersey, which is 1,300 yards from quay to quay, is now arched in, and the greater part of the land approaches finished, so that the laying of the permanent way will shortly commence. The total length of the line will be 4½ miles, independent of some extensions now proposed. It runs from the London and Northwestern and the Great Western joint lines at Birkenhead to the Central Station at Liverpool, the course being chiefly under the streets in the land portion. The underground parts of the stations are in a forward state. The hydraulic machinery for lifting train loads of passengers, the machinery for mechanical ventilation, and the locomotives and carriages are in course of manufacture. It is expected that the railway will cost half the mileage rate of the Metropolitan Railway, and that the main line of three miles will be opened about June next.

The Rocket.

THE following letter, signed "Robert Stannard" appears in the London *Engineer:*

"The sketch made by Mr. Nasmyth represents *not* the 'Rocket,' but the 'Northumbrian'—except that it does not show an awkward projecting step attached to the leading end of the latter engine's tender, against which my father one day tore his knee and was slightly lamed for life, and that there were, I think, no funnel stays on the 'Northumbrian.' At any rate the sketch is nothing like what the 'Rocket' was in 1830.

"The 'Rocket' which ran on the day of the opening, and subsequently, was the identical 'Rocket' that ran in the Rainhill trials in 1829. She was completed only just in time for the competition, and never ran a single trip before then. In the evening after the first day's trial, Mr. Stephenson said to my father, 'Now, Stannard, let us have a trip to ourselves;' whereupon he got up, followed by Wakefield, the driver, my father, Mr. Booth, Mr. Moss, and myself. There was not much room, and Mr. Stephenson remarked, 'Put your boy up on the tub, Stannard; he'll be more out of harm's way there;' and there indeed I sat (on the tender) during my first ride on the 'Rocket.' As the butt had been newly painted only the day before, I stuck on very literally while we ran some four miles out and back.

"The enormous funnel made her rather end-heavy, and at last brought her to grief. One evening, going at a good speed, she jumped at a bad joint and tipped up, head downward, in the track, killing an unfortunate visitor, and considerably damaging her funnel and front framing. She was then taken to the shops and fitted with a smoke-box, and a shorter funnel, and after about a fortnight she was sent back to my father again, who worked her up to a very short time before the opening day. I believe no other alteration was made in her till after the 15th of September, 1830. The same water-butt was on her tender on the day as she carried in the previous October, and it was used for a while afterward, but was eventually replaced by a wrought-iron box tank, carried on the same tender. The 'Rocket' worked regularly on the line after it was opened, but was displaced as soon as a sufficient number of heavier engines were provided to deal with the traffic. From facts for which I can vouch from my own knowledge it is clear that the 'Rocket' of 1830 was the same engine as the 'Rocket' of 1829 with an altered funnel; that she worked nearly all the time between her recorded public appearances, and that she did run in the regular service on the Liverpool & Manchester Railway."

Danger in Carrying Corpses.

THE general agent of the Pennsylvania Railroad has written to the Health Officer of Philadelphia, stating that in several instances baggagemasters on their trains have contracted serious sickness by inhaling the fumes arising from dead bodies in coffins or cases, insecurely fastened. In view of this fact and of the expected importation of contagious diseases from abroad during the coming summer, he suggests that the Board of Health consider the question of making it obligatory on the part of physicians and undertakers "that no corpse to which death resulted from a contagious disease of any kind be offered for transportation, and that any other corpse be accompanied not only by a physician's certificate, showing the cause of death, but by one from the Health Department, permitting its removal by train, and that all coffins or cases carrying corpses for transportation by rail be hermetically sealed."

Death of the Oldest Locomotive Engineer in the Country.

JULIUS D. PETSCH, the oldest locomotive engineer in the country, died last month in Charleston, S. C., the city of his birth. He ran the first locomotive ever built in this country and the second ever in use on an American railway. This locomotive was built at the West Point Foundry works in New York in 1830, and was called "The Best Friend of Charleston," having been built for use on the South Carolina railway then in process of construction. It arrived in Charleston on October 23, 1830, and was placed on the road on November 2, 1830. The second engine constructed in this country was built by the West Point works for the same road, which was begun in 1830, and was opened for traffic in 1833, for its whole length, 135 miles. At that time it was the longest continuous line of railway in the world.

Mr. Petsch, as already stated, was the engineer of "The Best Friend of Charleston." He succeeded in inventing a number of improvements to it, which, had they been patented, would have probably yielded him a handsome fortune. The most important of these improvements was the shrinking of wrought iron tires on iron wheels and the placing of what are known as "the outside connec-

tions" on a locomotive. After serving as engineer for some time he was promoted to the office of superintendent of the South Carolina Railway during the presidency of Mr. H. W. Connor.

During the Seminole war Mr. Petsch was employed as an engineer in Florida. As a master machinist, Mr. Petsch was known all over the State. He superintended the building of the "New Bridge" over the Ashley river, the placing of the machinery in the Confederate gunboat *Chicora* during the late war, and the erection of the machinery in the cotton mill at Graniteville, S. C. He was in his seventy-eighth year at the time of his death.

Railways of British Guiana.

THE Demerara Railway extends from Georgetown, the capital of British Guiana, twenty miles into the interior. The description of country penetrated is low, flat and swampy, of such a character in fact as would only be chosen by Dutchmen, the present natives. There are 150 small bridges necessary in the length of this road which cross the numerous canals used for drainage purposes. The surface of the land is below sea level. Branch lines, varying from one-half to about two miles in length, extend from the stations to the estates of the principal farmers for the accommodation of the freight traffic.

The company has 8 locomotives, each having 3 pairs of driving wheels and 2 each having 2 pairs, 14 passenger-cars of various classes and 202 freight and other cars.

During the year 1883 there were 325,663 passengers and 76,774 tons of freight transported.

The earnings for that year amounted to $191,762.78, while the operation for the same period cost only $88,-028.40 leaving the handsome net amount of $103,734,38, after paying the above expenses.

Running Locomotives.

"LOTS of chaps think it would be fun to run an engine," said the driver, as he stuck his head, a flaming torch and a long-necked oil can in under his machine, "but if the most of 'em would try it they wouldn't like it quite so well. 'Taint everybody can run a locomotive either, though I s'pose it's like running a daily newspaper, which I've heard tell everybody can do. Now, a nervous man has no business in a cab; no more has a careless one or a stupid cuss. To run an engine a man must feel his responsibility, and keep his head level. I don't believe half the people know what it is to run an engine. Now, there's the machine; that is the first thing, and it has to be in good order, and stay so. A locomotive has to stand wear and tear and weather that'd knock a stationary engine into smithereens. And no matter what emergency rises—freezing of pipes or starting of flues, a loosening of packing or heating of journals—we've got to know just what to do, and do it right quick, too. Then when we're running there's the time-cards, and pretty often a new one. And the train orders—they are life and death and reputation to us, and to read 'em correct and to live up to 'em gives us no end of anxiety. Bet I've read a train order over a dozen times an hour—I am always so afraid of making a mistake or forgetting. You know the consequence of even a little mistake sometimes. Then, there's the signals to watch, the conductor's gong overhead, steam to keep up, time to make, whistle-posts and crossings to look out for, bad spots in the road to be careful on, and along with all this, there's the track ahead of ye which your eyes mustn't leave for more'n five seconds. There's the brakes, too—one is always worrying about them. I don't s'pose everybody knows, either, that we have to be mighty careful when we come to the top of a grade. You see in going up she labors hard, and so as soon as she begins to descend she makes a rush, and there's the danger of breaking your train when the rear cars are still dragging on the up grade. This danger is especially great on freights, but no good engineer fails to shut off some of his steam when his engine reaches the summit. It isn't every fool that can run a locomotive."

Steel Rail Production.

THE productive capacity of the steel rail mills of the United States is about 1,600,000 tons per annum. About 600,000 tons went into new lines last year, and the amount used on renewals, new second track, and siding, is estimated as 650,000 tons, or 5.42 per cent. of the total amount of rails in track. This rate is equivalent to a renewal of the lines once in 18.4 years. At the end of 1883 a little more than half the track of the United States was iron. The consumption of rails for maintenance ran down from 10.30 per cent. in 1872, when steel rails were first used, to 5.92 per cent. in 1877; then rose again to 11.16 per cent. in 1881, and receded again to 5.42 per cent. in 1883.

The Oldest Passenger-Car.

PROBABLY the oldest passenger-car now in use in this country is on the Tioga Railroad. It is called the "Morris Run," and was built in Wilmington, Del., in 1840. The original cost was $2,000, which was considered a large sum in those days.

IT is now proposed to make a tunnel and railway through the Splugen. The project is regarded with great favor by those interested in Lombardian railways, and support is looked for from Bavaria, Wurtemberg and other parts of Germany. The estimated cost of the whole work is about $16,200,000.

THE report of the Mexican railway company for the half-year ended June 30th shows: Gross earnings on the main line, $2,020,650 against, $3,082,100 in 1883; and net earnings, $1,242,115, against $1,699,170 in 1883. The net earnings of the Jalapa line were $13,560, against $20,385.

THE first railway guide-book was called "Gadsby's Monthly Railway Guide," and it appeared i. 1839, its price being three-pence. Out of it grew "Bradshaw's," the great European guide-book, which was first issued in 1842.

THE Pullman shops at Pullman, Ill., are to build 50 passenger cars for the Staten Island Rapid Transit Co., to be delivered by May 1 next. They are to be light cars, similar to those in use on the elevated railroads in New York.

THE surveys of the proposed railway from Tapachula to San Benito, Chiapas, are now completed. The length will be 18 kilometers.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

THE MAGNITUDE OF FUTURE STREET-RAILWAY OPERATIONS IN NEW YORK.

WE publish elsewhere in this department an interesting series of tables prepared by the New York Arcade Railway Company for general distribution, showing conclusively that the operation of street-railways in this city is on the marked increase. As in New York so is it fair to conclude is it in other cities, and the deductions drawn from these statistics are fully borne out by the premises.

In the year 1850 there were but two street-railways in this city, carrying 6,835,548 passengers annually. In the year 1884 twenty-three street-railways carry annually 284,115,862 passengers; thus while in round numbers there are now twelve times the number of roads that were operated in 1850, there is over forty times the passenger traffic, the traffic increasing nearly four times as much in proportion as the facilities of travel. In the same space of time the population of the city has increased from half a million to a million and a quarter, an increase of one hundred and fifty per cent., and the surprising conclusion is reached that the passenger traffic of the roads of New York has increased twenty times as much in proportion as the population of the city.

Adding to the total number of passengers carried in 1884, the passengers carried by the three omnibus lines, which may be classed in the same category as street-railways, amounting to 18,067,500, we are furnished with a grand total of 302,183,362 passengers, which at an average fare of five cents yields a total of $15,109,168.10 as revenue to the street-railways of this city during the past year. It is true that these figures include the traffic and revenue of the elevated roads, but the four lines of the latter carried less than one-third the total number of passengers, and the five leading surface roads, the Third Avenue, Second Avenue, Dry Dock and East Broadway, Sixth Avenue, and Broadway and Seventh Avenue roads carried an excess of over seven million passengers as compared with the total passenger traffic of the four elevated lines, thus disproving the assertion that the introduction of the elevated roads has marked the decline of the surface roads. It is further demonstrated that the natural growth of passenger traffic in this city during the past seven years, or since the construction of the elevated roads, is over twenty-three millions in excess of the total annual traffic of the elevated roads. It is also true that the leading surface road, the Third Avenue, carried in the past year over thirty-one million passengers, or about one-third the total traffic of the four elevated lines, thus proving that the surface roads, despite the disadvantages under which they labor, still control their full share of traffic.

The mere mention of these collated facts is interesting, but the inevitable deductions to be drawn therefrom are highly instructive and warn us of the needs and requirements of the future. Tabulating the increase of population of New York City, the increase of its traveling facilities, and the increase of passenger traffic since 1850, we are furnished with an index of our future requirements. This tabulation may be expressed as follows, the unit being an increase of one hundred per cent.:

Increase of population	1½
Increase of railway lines	10½
Increase of passenger traffic	40½

Upon this basis it is easy to comprehend that the increase of passenger traffic far outstrips the increase of facilities and to a much greater extent the increase of population, and assuming the present ratio of increase of population to continue for the ensuing sixteen years, in 1900 there will be a total passenger traffic of several billions.

But the tabulated statistics which we publish assume a fairer basis of computation in omitting the figures of the early days of street-railways, reckoning only upon the experience of the past twenty years, and upon this basis, which is a most moderate one, we are given a total traffic in 1900, of one billion and a quarter of passengers. A still more moderate estimate is made by reckoning from the experience of the semi-decade 1875-1880, a period of remarkable business depression, but even with these figures we are furnished with a total annual traffic sixteen years hence of nearly eight hundred and fifty million passengers, and in the full knowledge that at present the street-railways of the city, including the elevated roads, are taxed nearly to their utmost capacity, it is evident that provision will have to be made during the next sixteen years for at least five hundred and sixty million additional passengers, and during the next six years for nearly one hundred and forty million. In the face of these figures it is evident that the street-railway interests of this city as well as of the entire country are rising to great prominence, and attracting the attention of capitalists. The increase of roads, of rolling stock, and of invested wealth are great stimulants to an improvement of service in every respect,

and problems of street-railway construction and management are daily assuming greater proportions. Without attempting to prescribe the ways and means for overcoming the difficulties, it can also be said that other methods of traction than horse-power must ultimately be employed, both on the grounds of economy and speed, and it is not going too far to say that other avenues of travel than the surface of our streets must also be selected for the construction of roads. The solution of these problems will be the work of years, but eventually it will be reached, and so thoroughly has public interest been awakened to the magnitude of street-railway operation and of the interests involved, that the columns of our daily press are replete with discussions as to the construction of new roads and the introduction of new methods of operation and management. The year past has witnessed a strong revival of street-railway enterprise in this city which had lain dormant since the elevated roads went into operation, but we will be surprised if the present year does not see this revival widespread, and attracting universal attention.

ARGUMENT still continues upon the advisability of constructing a surface road upon Broadway. The scheme has warm friends and bitter enemies, neither of whom it is reasonable to suppose are wholly disinterested, but so thoroughly has the project attracted public attention, that it is highly improbable that jobbery will be permitted in furtherance of any interests involved, and if the road is constructed the consolation will be afforded that the franchise has been honestly awarded at a fair valuation.

CENTER-BEARING VERSUS SIDE-BEARING RAILS.

BY A. J. MOXHAM.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN discussing the relative merits of the two forms of street-railway rails, the subject will be considered from a purely rail standpoint. That aspect of the question which involves the effect of the rail upon passing street vehicles is one that permits of good arguments for either form. Both must be non-obstructive to street traffic. This granted, it is questionable whether anything more is due, and if not, such question as might arise would be purely local, and one that would be settled by policy rather than rail merit.

The first and principal objection urged against the side-bearing and in favor of the center-bearing rail, is the easier traction on the latter. The close proximity of the head of the side-bearing rail to the street surface tends to keep it constantly dirty, and adds materially to difficulty of traction, and to an equal extent to the discomfort of the passengers. Of this there can be no question; it must be and is accepted as inevitable. A second objection urged against the side-bearing rail is that the constant passage of the weight of the car on the one side tends to tilt the rail. It is thought that this is exaggerated; the rail can only tilt by compression and yielding of the stringer on the edge most compressed. Were street-cars the only vehicles passing over the rail it might be a consequence; but it is a fact that whereas the car weight tends to this compression, all the other vehicles using the tram tend to reverse or equalize this outer compression. This objection is most strongly urged in the larger cities, and yet it is a fact that in these cities the street traffic far exceeds the car traffic, both in weight and number. As an example: On one of the main streets in Philadelphia, the wagons passing on the track were counted for twenty-five minutes; they numbered 103. The passing street-cars were not counted, but at a one-and-a-half minute headway they could not have exceeded eighteen. If the tendency of the rail to tilt be due to a difference of compression in the various parts of the stringer, certainly there is nothing here to indicate that the difference exists on the head side. It is questionable whether, if the center-bearing rail were subject to precisely the same conditions of use, it would show any advantage over the side-bearing in this respect. The problem would be merely reversed, the car weight being sustained by the center, and that of street vehicles by the side or edge of the stringer.

It has been urged by some that the form of the center-bearing rail does not invite street traffic to the same extent as that of the side-bearing. Doubtless this is true *cæteris paribus*, but if it is remembered that whether the rail invite street traffic or not, it at least must not interfere with it to any unreasonable extent, and further, that in a crowded thoroughfare the street traffic *has got to use the rail* whether invited or not, there does not remain any great scope for such argument. It is, however, a fact that few street-railway men realize this. If the center-bearing rails in New York be carefully examined it will be found that by far the greatest wear to the rail has occurred to the side trams; and it will be further found when the rails have lived their day, that a comparatively small proportion of the head has been utilized. An interesting test was made of this point by the writer. The percentage of wagons using the tracks were counted, first on the side-bearing rail in Philadelphia; secondly, on the center-bearing rail in New York. The locality chosen in Philadelphia was Market street, between 8th and 9th streets; of 129 vehicles, 106 were using the track, or 82.17 per cent. The locality chosen in New York was Chatham street near Pearl street, and Canal near West Broadway; of 174 vehicles, 128 were using the track, or 73.87 per cent. There was thus a difference of but about nine per cent. in favor of the center-bearing rail.

It is, however, doubtless true that in a medium-sized town of only average amount of street traffic, and with wide streets, the center-bearing rail is less used by the street vehicles than the side-bearing. But it is thought that this advantage decreases in proportion to the extent to which any thoroughfare is crowded, and that in very crowded streets it becomes *nil*. For these reasons it is thought that the tendency to tilt is not due to the side-bearing head.

It can, however, be attributed to a cause induced by the fact that the *tram* (not the head) is side-bearing. That cause is curvature of the rails induced by street traffic. A dozen points can be selected in Philadelphia where, taking position in the center of the track and looking in

perspective along say a quarter or third of a mile, every rail will be seen to have assumed the form of a parabolic curve; the curvature being so clearly defined at every joint that these joints can be counted by it for a considerable distance. To one not accustomed to mechanical operations. it is hard to realize that a heavy rail can be changed in form by loads passing over it, any one of which is not sufficient in itself to apparently even disturb the rail; such is nevertheless the fact. It is like the mechanic's six-ounce tymping hammer, the problem of a very small force infinitely applied.

I have in my own experience changed the form of a casting weighing about 6,000 lbs., by a tymping hammer. It was a squeezer scroll, slightly out of true spiral; it was suspended so that its weight aided the change of form desired, and though eighteen inches deep by four inches thick, it yielded to treatment in two days' work.

This curvature throwing the head over the stringer, the rail tilts. This action in the side-bearing rail is aided by the exposed condition of the spikes; they become so loose that they fail to contribute their proper share in the holding of the rail.

The center-bearing rail seems entirely free from this defect. It is true the trams are also subject to the elongating strain of street traffic, but this occurs on both sides of the head. It is only any difference that may exist in the local strain induced in either tram that tends to curvature in such a case, and this is so slight that the head is amply able to resist the change of form thus invited. Again, the flanges being narrower, the leverage with which this net difference acts is materially reduced, and as another factor, is the better hold of the spikes. In a side-bearing rail, a wheel passes over every spike in the rail it is using; in the center-bearing it only passes over half the number.

For the two important reasons given, viz.: greater cleanliness of head and consequently easier traction, and capability of retaining its true alignment, there can be no question that the center-bearing is the better rail of the two.

The center-bearing section as now designed, seems capable of some improvement. Its use has led to conclusions that are largely followed, which it is thought in some instances are fallacious; one is, that great height of head is advantageous. It is argued that it contributes largely to greater cleanliness. Is this so?

It must be remembered that even a small increase in the height of head means a very great increase in the obstructiveness of the rail to passing vehicles. The question of one-fourth of an inch difference in this respect has been known, in my experience, to have gotten the railway company into considerable trouble both with the owners of vehicles and the municipal authorities. It goes without saying that, if it were permissible to increase the height of head to say six inches, such head *would* be cleaner. It is not, however, a question of inches, but of fractions of an inch, and it is believed that the small addition permissible adds so much more to the obstructiveness of the rail than it does to its cleanliness, that the tendency is to push it too far. In Louisville a center-bearing rail is in use with a head about one inch high. In New York and Brooklyn, one with a head from 1¼ inches to 1⅜ inches high, measuring in both cases from the bottom of the groove in the tram. Both rails are five inches wide. I have carefully watched the use of both, and have tried to institute a comparison as to their cleanliness and easy riding in as nearly the same conditions of street surface as possible, taking a pasty, sloppy condition in both cases. I have been unable to ascertain any noticeable difference in favor of the higher head.

The effect of ¼ or ⅜ inch increase in the height of head is in proportion to its relation to the varying height of accumulation on the street surface. Were that variation never over ¼ inch it would be a large factor; but when, as is the case, it amounts to several inches, it ceases to be so.

The benefit of the increased weight and consequent stability of the New York or Brooklyn rail should not be placed to the credit of this particular point, as it often is, in the general assertion that it is a better rail. I believe it possible to show that any increase of weight can be more advantageously bestowed elsewhere. It is believed that a short analysis will show that the real factor of cleanliness is the use of the two side trams.

Every vehicle using these trams plows its way through any accumulation that may have encroached upon the rail, throwing it out and into the street. The tendency of the same is of course to return, it being remembered that the level of the now comparatively clean tram is below that of the neighboring accumulation. Were the dirt as liquid as water, its return would be simultaneous with the passage of the wheel. Being generally less plastic, it takes longer.

The time it takes to reach the rail again is governed by the distance it has to travel, (viz.: the width of the wheel that has passed, and its speed of flow.) If it takes say a half minute to return, and wagons pass at smaller intervals, the rail is kept continually more or less clean.

The passing wagons are thus effectual in keeping the head clean by the use of the side trams, and the design of the rail should be such as not to let its height of head reach that limit of obstructiveness which will interfere with the tendency of a sufficient number of wagons to use the track to certainly effect this purpose. The width of side trams is no factor in the problem, it being of course assumed that they are sufficiently wide to permit of use. The cleansing process is effected by the wagon wheels.

Another point that seems worthy of some thought is the practice of grooving the side trams. It is claimed that it protects the spike-heads; so it does, as long as the tram retains its projection. An examination of the rail, where it has been in use for even a short time, will show that this point is that of most rapid wear in the rail. It increases in speed of wear in proportion to the extent of the groove, for this groove merely means that the rail offers just that much less metal to take up the wear from street vehicles.

It is hence a fact that the more the spikes are protected (?) the quicker the street traffic gets at them. The spikes could be just as thoroughly protected by rolling countersinks in a solid tram, and the greater amount of metal thus introduced would effect two purposes: First, retain the weight and consequent stability of the rail at the desired point (having as indicated partly reduced this by taking off part of the head), and secondly, induce a greater life in the side trams.

In this discussion I have instituted a comparison between the two shapes under, as nearly as possible, the same

conditions of usage, and I have put the standard of usage at the maximum, that in the crowded thoroughfare of a large city. The wear of the different parts of the rails would, of course, vary under other circumstances. The object has been purely a comparison.

It is a fact not often fully considered that the proportions of the different parts of a rail should really vary, as the general extent of street traffic at any given point varies, in proportion to the traffic of the street-cars.

THE PAST, PRESENT AND FUTURE OF PASSENGER TRAFFIC IN NEW YORK CITY.

THE following table of official figures issued by the New York Arcade Railway Co., exhibits the lines of street-railway and passenger-traffic of New York City, from the year 1853 to 1884, as related to growth of population:

Population.	Railways.		Passenger Traffic.
1850 515,547	2	1853	6,835,548
		1854	6,817,197
1855 629,810	4	1855	18,488,459
		1856	23,153,050
		1857	22,190,431
		1858	27,900,388
		1859	32,888,794
1860 813,669	6	1860	36,455,242
		1861	26,274,360
		1862	35,878,044
		1863	40,412,357
		1864	60,900,200
1865 726,386	12	1865	82,054,516
		1866	88,953,016
		1867	100,541,562
		1868	105,816,695
		1869	114,349,123
1870 942,292	12	1870	115,139,553
		1871	133,893,981
		1872	143,696,989
		1873	145,358,805
		1874	151,927,233
1875 1,045,223	19	1875	166,918,173
		1876	168,413,971
		1877	163,936,298
		1878	170,189,502
		1879	187,983,792
1880 1,206,299	23	1880	211,222,348
		1881	231,386,771
		1882	252,871,646
1883	23	1883	268,749,877
1884	23	1884	284,115,862

OFFICIAL FIGURES OF PASSENGER TRAFFIC FOR 1884.

Broadway and Seventh Avenue	17,771,110
Central Cross Town	3,540,583
Central Park, North and East Rivers	15,849,985
Christopher and Tenth Streets	4,492,771
Dry Dock, East Broadway and Battery	18,141,414
Eighth Avenue	14,466,240
Forty-second and Grand Street Ferry	8,544,012
Harlem Bridge, Morrisania and Fordham	2,908,244
Houston, West Street and Pavonia Ferry	4,387,699
New York and Harlem	15,638,579
Ninth Avenue	3,380,315
Second Avenue	19,397,072
Sixth Avenue	17,273,570
South Ferry	546,851
Third Avenue	31,395,490
Twenty-third Street	10,279,303
Manhattan Elevated	96,702,620
	284,115,862
Adding three omnibus lines, which carry	18,067,500
Produces a total passenger traffic for 1884	302,183,362

INCREASE OF PASSENGER TRAFFIC FOR SEVEN YEARS:

No. passengers, exclusive of omnibuses, 1884	284,115,862
No. passengers, exclusive of omnibuses, 1877	163,936,298
Increase in 7 years	120,179,564

The above figures show that the natural growth of passenger travel for the seven years, exceeds the total traffic of all the elevated roads by 23,476,944.

It will be seen by the above table that in the year 1884 the Third Avenue horse-railroad carried over 31,000,000 persons, and that five leading horse-car lines carried, in excess of all the elevated roads, 7,275,934.

INCREASE OF TRAFFIC, GROWTH OF POPULATION, AND ESTIMATES FOR FUTURE TRAFFIC.

The increase of population during the present century has averaged $46\frac{7}{10}$ per cent. per decade, and passenger traffic during 20 years past, has increased $141\frac{4}{10}$ per cent. per decade, or as $3\frac{29}{100}$ for passenger traffic, to 1, for population; upon this basis the traffic in 1890 would be 509,045,858; and in 1900, 1,226,800,517.

Selecting as a basis of calculation, the semi-decade from 1875 to 1880 (remarkable for great financial depression), showing the lowest percentage of increase of travel, viz.: as 15 of population to 27 of traffic, or approximately, 2 of traffic to 1 of population, the passenger traffic in 1890 would be 422,444,696; and in 1900, 844,889,392.

It will be seen that, at the lowest estimate, provision will have to be made for an increase of traffic within six years, or in 1890, of 138,328,834; and 16 years hence, or in 1900, of 560,973,530.

ADDITIONAL ACCOMMODATIONS INVARIABLY PRODUCE GREATLY INCREASED RATIO OF TRAVEL.

The following table shows the number of railways in operation and average number of passengers carried yearly by each, and demonstrates that increase of travel is stimulated and in a large degree governed by the additional accommodations furnished:

In 1855	4	railways carried each	4,622,114	18,488,459
In 1860	6	" "	6,075,873	36,455,242
In 1865	12	" "	6,837,876	82,054,516
In 1875	19	" "	8,785,167	166,918,173
In 1884	23	" "	12,352,863	284,115,862

At no time in the history of passenger traffic of the city have the accommodations been sufficient, and invariably the construction of additional railways has been followed by a remarkable increase in passenger travel. The need for additional transit facilities was never before as urgent as now, and, with a continuous yearly increase of more than twenty million constantly swelling the demand, it is evident that additional provisions to meet this necessity must immediately be made.

Experiments with Electric Locomotion.

IN a few weeks it is expected that preparations will have been completed by the elevated roads of New York for a test of electric locomotion on the Second Avenue line. A central line will be laid between the rails from Chatham Square to the Harlem River terminus, to which electricity will be conducted from dynamos. This rail will be insulated, the present tracks remaining as they are. The expense of building the third rail will be divided among the electric railway companies, all of which will be allowed equal facilities for experiments with the motors. A commission is to be selected by the companies to decide on the relative merits of the inventions, and after their decision a company will be formed to control all the patents for the several companies for this country, and for these rights each company will receive stock in the new company in proportion to the value of the property and patent rights conveyed by it. It is claimed that the regulation of the speed of trains will be less difficult with electricity than with steam, and that the trains can be stopped more quickly and be at all times under more perfect control. The noise will be less, and the smoke and cinders will be avoided altogether.

Extent of the Cable Road System.

ANDREW S. HALLIDAY, of San Francisco, who invented the system of cable railways in 1869, was recently asked by a New York *Tribune* reporter if he had experienced much difficulty in introducing his system. He smiled and said: "I think I had. I invented my system in 1869, but the first cable street-railway was not built and ready for use until September, 1873. The first bit of road was built in Clay street, San Francisco, which was 49 feet from house to house and was full of gas and water mains. People laughed at me and were afraid to invest in the scheme. Three friends, Joseph Britton, Henry L. Davis and James Moffitt, helped me in the undertaking. The grade of the street was one in five, pretty steep, and the line was 2,800 feet long. The road soon became a success. It made money and carried passengers at a low rate. It was cleaner than a horse-railway. There were less delays upon it, and it was able to carry as many people as an almost continuous line of cars would carry.

"Soon afterward a horse-railway company converted their line into a cable-road, and the shares of the company advanced in a short time from $22 to $102. A year later a cable road was built through California street. To-day there are thirty miles of single track cable roads in that city. More than half of this length of road has been converted from horse-railways. There are over twenty miles of cable road in Chicago, and they worked last Winter without losing a day, even with the ground frozen to a depth of two and a half feet. The streets are kept clean with far less trouble with a cable road than a horse-railway. A 500 horse-power engine can certainly do more work than ten horses hitched to a street cleaner. Dunedin, New Zealand, a city of 30,000 inhabitants, has two cable roads. A company in Melbourne has just obtained a franchise for sixty miles and will put stock to the amount of £1,500,000 on the market. Sydney, New South Wales, has adopted the system. The premier of New South Wales visited San Francisco eighteen months ago to inspect it. Edinburgh, Scotland, has decided to adopt the system, and Birmingham and Manchester, England, are considering the advisability of following suit. Roads will shortly be built in Pachuca and Guanajuato, Mexico.

"Seven millions of dollars have been spent in San Francisco in the construction of cable roads, and that sum is paying large interest. A well equipped road will cost from $75,000 to $200,000 a mile. This includes power and equipment. I have a short road in London, England, which I built after a hard fight with the various carrying companies. It possesses the stone on which Whittington sat with his cat, when he heard the bells telling him to turn back. I believe that passengers could be carried over the East river bridge for two cents, and that this rate would pay the carrier. Any number up to 30,000 could be carried per hour."

STREET-RAILWAY NOTES.

THE presidents of street-railway lines in Philadelphia have been elected as follows: Empire, James McManes; Union, William H. Kemble; vice-president, P. A. B. Widener; Continental, W. L. Elkins; Seventeenth & Nineteenth, M. S. Quay; Ridge Avenue, E. B. Edwards, vice-president, John Lambert; Second & Third, Alexander M. Fox; Frankford & Southwark, Henry Geiger; Chestnut & Walnut, William W. Colket; Tenth & Eleventh, John McCarthy; Hestonville, Mantua & Fairmount, Chas. H. Lafferty.

THE city solicitor of Philadelphia has given an opinion that the charter of the Philadelphia and Northern Railroad Company, which is to construct an elevated railroad in that city, is in regular form, but the company will be liable for all real and consequential damages arising from the construction of the road.

THE Union Depot Street-Railway & Transfer Company of Stillwater, Minn., has gone into the hands of a receiver. The liabilities are stated to be but fifty per cent. of the assets and the company is soon expected to resume business.

THE city council of Kansas City, Mo., have passed an ordinance for the construction of an elevated railway between Kansas City and Wyandotte, and the work of construction will soon be commenced.

THE Manchester (Va.) Railway & Land Improvement Company recently organized for the purpose of building a street-railway, invite proposals for furnishing the necessary cars and rails.

IN the department of New Inventions of this issue of the JOURNAL, are published illustrated descriptions of a horse-car canopy and of a street-railway rail.

Two new lines of street-railway have recently been opened in Durango, Mexico.

WANTED.

A Situation with some Street-Railway Co.,

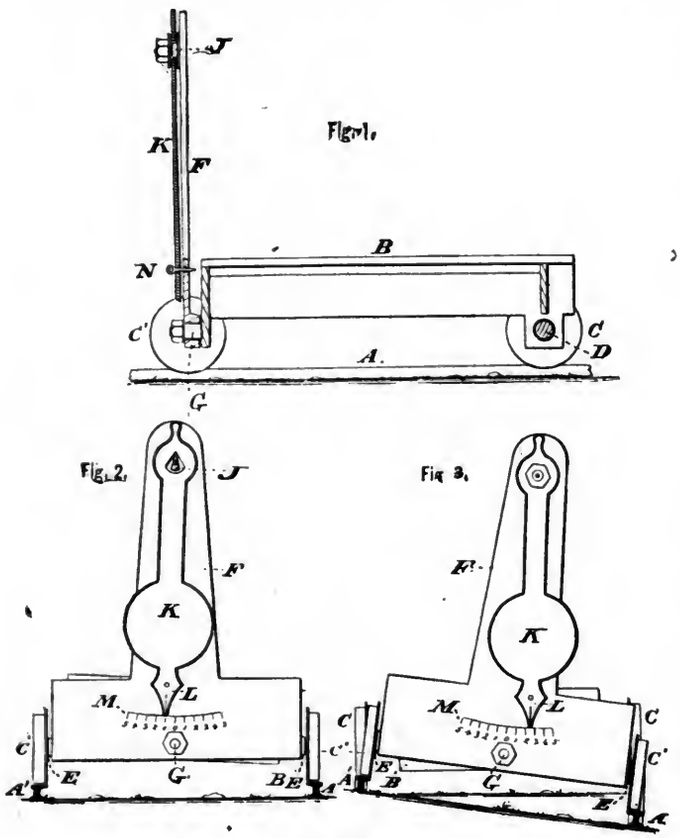
by a gentlemen who has been brought up in the business and has had experience in its every department. Is road superintendent of 25 miles of street-railway, and desires to make a change March 1st. Satisfactory reasons given for leaving present position and best of reference given, including present employers. Address,

"SUPERINTENDENT,"
Care of American R. R. Journal.

New Inventions.

McGregor's Railway-Gage.

GEORGE MCGREGOR, of Cincinnati, O., is the inventor and patentee of a railway-gage, the object of the invention being to provide a means for verifying the proper relative elevation of the two rails composing a railway-track or their degree of departure from such relative elevation, it being understood that on a straight stretch the component rails should show precise agreement of level,



MC GREGOR RAILWAY-GAGE.

while on curves their relative height should have a certain predetermined difference, depending on the sharpness of the curve and the maximum speed of running.

The invention consists in hanging a plumb-bob or pendulum on a standard, which is so pivoted to the car-body as to be capable of free oscillation transversely of the track, the standard having attached to it the axle of the front wheels, and the pendulum being capable of hanging vertically, notwithstanding oscillations of the standard, and indicating upon a graduated scale inscribed upon the standard whether at that precise plane the two rails are at the same level or to what extent out of level. For this purpose the graduations on the scale are made to indicate the exact relative elevations of the two rails in parts of inches or of centimeters, or any other accepted basis of measurement, by the pendulum falling over to that side which is, for the time being, more depressed than the other.

In the accompanying cuts, Fig. 1 is a fore-and-aft vertical section of a railway-car embodying the invention, and Figs. 2 and 3 are front elevations of such a car at two different parts of an uneven track. The reference-lettering is similar throughout the cuts.

A A' represent portions of the component rails of a railway-track. B represents the body or platform of a hand-car, whose rear wheels C, are keyed fast to the customary shaft D. This shaft or axle, where the car is adapted for propulsion by persons riding upon it, is connected by any suitable transmitting mechanism, with customary hand-levers. In the form selected for the present illustration the front wheels C', revolve freely on the front axle E, which is a true axle—that is to say, it does not itself revolve, being firmly attached to a standard F that is coupled to the car-body or platform B, by a pivot G, situated midway between and parallel to the rails. This construction enables vertical oscillation (about the pivot G) of the standard and of its attached axle relatively to both the pendulum and to the car-body and the rear axle.

From the upper part of the standard F projects a fulcrum J, in form of an inverted V, upon which is hung a pendulum or plumb-bob K, which terminates below in a pointer L, whose position relatively to a scale M, inscribed upon the standard, indicates the precise relative height of the two rails at that particular spot. Unnecessary wear of the pendulum when not in use may be prevented by the insertion of a pin N (Fig. 1), through suitable orifices in both pendulum and standard.

The above-described form of the invention may be varied in non-essential particulars. For example, the standard may be provided with such scale and corresponding pendulum on its rear, either instead of or in addition to its front side, as here shown. The front axle may, like the rear axle, be keyed fast to the wheels and revolve in journal-bearings, which bearings in that case are (instead of the axle itself) pivoted to the oscillating standard.

The inventor has assigned the patent rights to his son, George W. McGregor, of the same place.

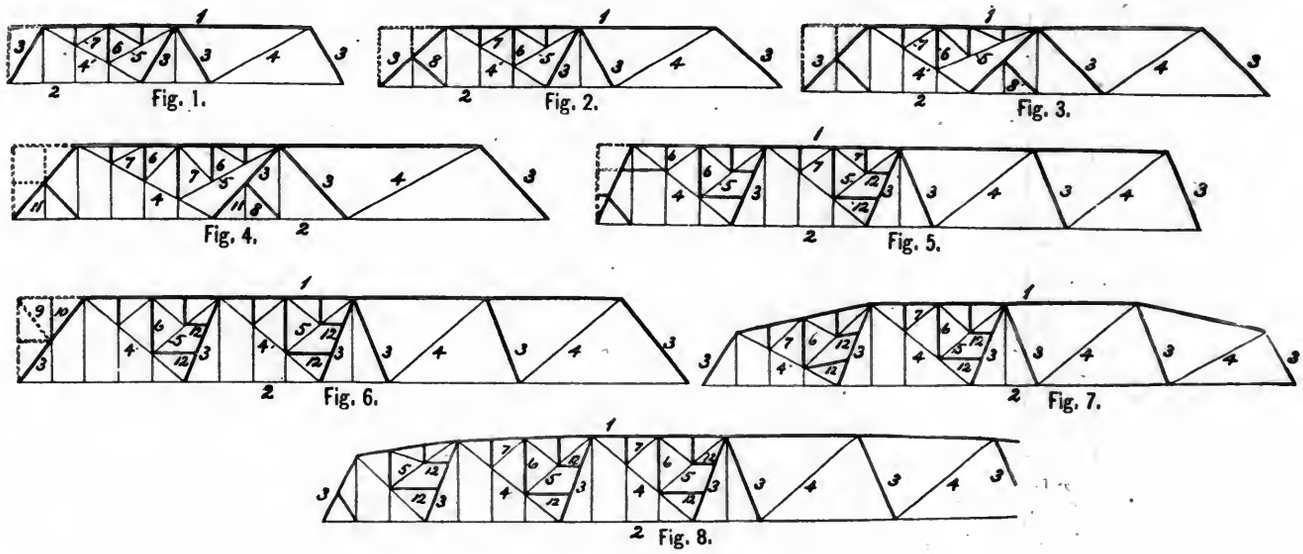
Thacher's Improved Bridge-Truss.

EDWIN THACHER, of Pittsburgh, Pa., has recently invented an improvement in the construction of bridge-trusses, the object being to provide a bridge-truss which shall be economical in material and inexpensive in workmanship, and which shall be exempt from temperature strains in its members, and from ambiguity in strains, and which shall not involve in its construction the use of counter-ties or adjustments of any description.

As shown in the accompanying diagrams the invention consists in the combination of a primary single-system triangular truss and secondary trussing forming a series of secondary triangles within those of the primary truss. Figs. 1 to 8 are diagrammatic side views, in elevation, of bridge-trusses embodying the invention, the figures of reference being similar throughout.

A primary truss is provided, which is formed of a top chord 1, a bottom chord 2, and a web of inclined struts 3, and ties 4, connected at their opposite ends to the top and bottom chords respectively, and forming therewith a series of triangles which are free to change their figure under the influence of temperature changes. Each of the center ties 4, extends over not less than three panel-lengths of the truss, and each of the struts 3, over not more than two panel-lengths. The secondary trussing, which, in connection with the primary truss, supports the

loads at panel points intermediate between the apices of the triangles of the primary truss, and transmits the strain of the loads to said points, is of the following construction: Secondary ties 5, lead from the top chord 1, at the apices of the triangles of the primary truss to the primary ties 4, which form the bases of the triangles at an intermediate point in the length of the ties, the secondary ties 5 forming, with the top chords 1, and primary ties 4, triangles, which are subdivided by a secondary trussing of posts 6 and ties 7, connected at panel-lengths into a series of smaller or secondary triangles, each having, as shown, a length of one panel. For points subtended by the primary struts, a strut 8, leading from the bottom chord 2, or a tie 9, leading from the top chord 1, is connected with the primary strut at an intermediate point, from which the load above or below is supported directly by posts 10, or suspenders 11, as the case may be. The primary struts 3, may be supported by horizontal or inclined struts 12, leading from points in the secondary ties 5, as shown in Figs. 5 to 8, or by other means.



THACHER'S IMPROVED BRIDGE-TRUSS.

In the several figures the primary trusses only are shown on the right, and both the primary trusses and the secondary trussing are shown on the left. The top chords 1, may either be straight, as in Figs. 1 to 6, inclusive, or broken, as in Figs. 7 and 8, and for deck-bridges the top chord may be extended as shown in dotted lines on the left of the figures.

It is claimed by the inventor that bridge-trusses constructed in accordance with his invention will be found to present the following advantages: They are free from the temperature-strains, which are exerted to a greater or less extent in counterbraced or quadrangular trusses, and which are due to the unequal size or exposure of the various members, or to a difference in the character of the materials employed.

The improved truss contains no confined quadrangles, and each triangle of which it is composed can freely change its figure under the action of temperature. Trusses composed of two or more complete systems of bracing of the ordinary construction are subject to ambiguity in strains—that is to say, the strains in the members are such as not to admit of exact calculation. This is particularly the case where the chords are curved or broken, and to some extent with straight chords.

In the improved truss the strain on each and every member can be accurately calculated. The weight at any intermediate panel point can be conveyed to the joints of the primary truss in a single route, and as the primary truss consists of a single system of triangular figures, the weight of every joint is borne to the masonry or supports by one route only, and consequently no ambiguity in strains can exist. The absence of counter ties or adjustments reduces the expense of manufacture, and obviates the overstraining to which counter-ties are subjected by unskilled or careless workmen. The construction is likewise economical in material proportionate to its capacity for supporting loads, and involves no expensive workmanship.

Gottlieb's Metallic Railway Cross-Tie.

ABRAHAM GOTTLIEB, of Pittsburgh, Pa., is the inventor and patentee of a metallic railway cross-tie which is herewith illustrated and described. The object of the invention is to provide a metal cross-tie and also devices for properly securing and leveling the rails on the ties, which is accomplished by shaping the tie so that it may be easily rolled or otherwise formed, and can be securely embedded in the ballasting, and also by constructing the fastening devices so that rails may be adjustably secured to the ties, thereby providing for tracks of varying gage and for variations of gage in the same track or line of road, and any irregularity in the alignment of the ties themselves.

In the accompanying cuts, Fig. 1 is a transverse sectional view of the cross-tie, the rail and locking-plates being shown in elevation. Fig. 2 is a top plan view of one end of the cross-tie, the rail being shown in section. Fig. 3 is a side elevation of the cross-tie, the rail being shown in section and received by a modified form of locking-plate. Fig. 4 is a plan view of the cross-tie. Figs. 5, 6, 7, and 8 are

plan and edge views of the forms of locking-plates employed at curves in line of rails. Fig. 9 is a transverse sectional view of a modified form of the locking-plate shown in Figs. 5 to 8. Fig. 10 is a side elevation of the same. The figures of reference are similar throughout.

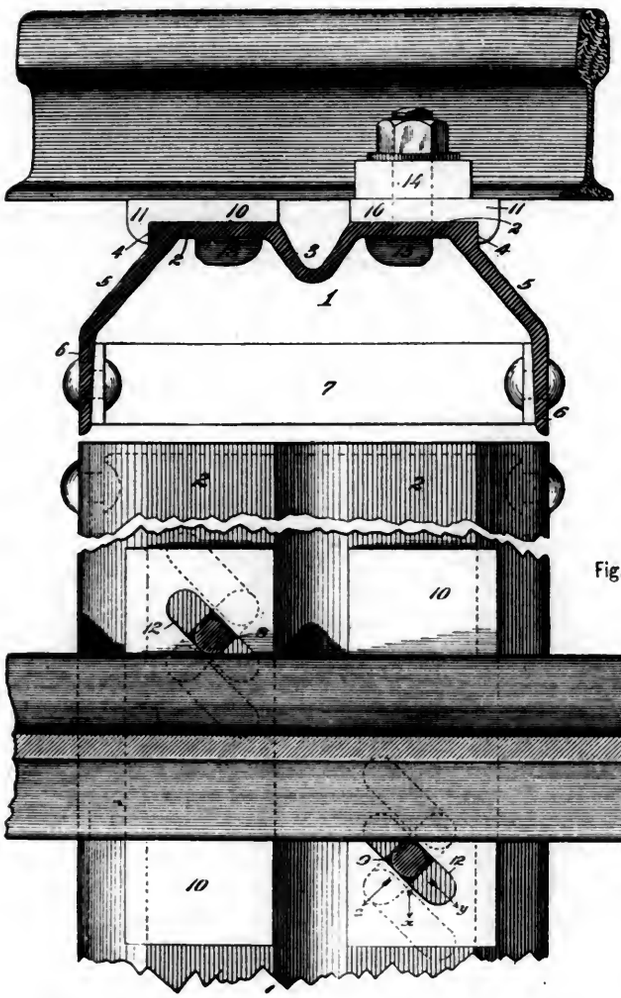


Fig. 1.

Fig. 2.

GOTTLIEB'S METALLIC RAILWAY CROSS-TIE.

The cross-tie 1, is formed with two beds 2, running parallel with each other longitudinal to the tie, and between these beds is formed the longitudinal groove or corrugation 3, thereby increasing the resistance of the cross-tie as against flexure, such increased resistance being especially important when the tie is not uniformly supported on its underside by the ballasting; and this corrugation allows of a slight yielding motion to the supporting-beds 2, thereby providing an elastic support for the rail. Along the outer edge of the supporting-beds 2, are formed the vertical ledges or walls 4, and from these vertical ledges extend the outwardly-inclined sides 5, the outer portions of which are bent inwardly to form the vertical wall 6.

The cross-ties constructed as above described can be formed from steel or iron blooms or billots in any desired length, by passing such blooms or billots through between suitably-grooved rolls and then cutting such rolled blanks into any desired lengths. The vertical walls 6, of the cross-tie are braced as against any spreading action by the transverse braces 7, secured by rivets or bolts to the vertical walls 6, at the ends and middle portion thereof. The number and distances apart of the braces may be varied at pleasure, though to get the best results one should be used at or near each end of each cross-tie and one at or near the middle. In addition to bracing the walls as above described, these braces 7 prevent longitudinal movement of the cross-tie, the ballasting being packed in and around the same.

In the supporting-beds 2, are formed the slots 8 and 9. The slots 9 in one of the beds, are arranged at an angle of forty-five degrees, more or less, to the central axis of the tie, and are located so that at least a portion thereof will not be covered by the outer flanges of the rails when in place. The slots 8, in the other bed have the same angular relation to the central axis of the tie as the slots 9, but are located so that at least a portion thereof will not be covered by the inner flanges of the rails when in place. The slots 8 and 9, at one end of the cross-tie are arranged parallel to each other, but are at an angle of ninety degrees to the slots 8 and 9, at the other end, which are also parallel to each other.

In place of having both outer slots, 9, in one bed, and the inner slots 8, in the other bed, each bed may have an

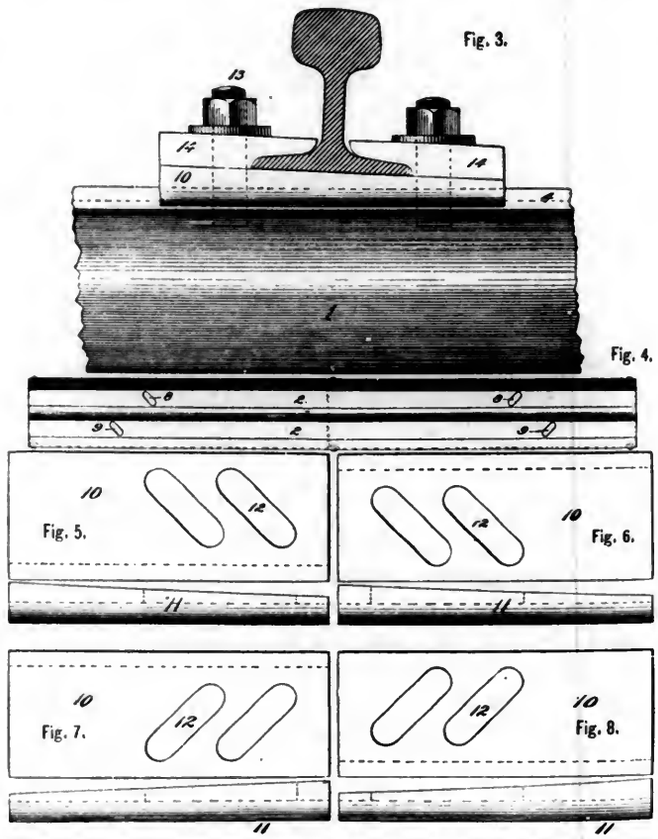


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

GOTTLIEB'S METALLIC RAILWAY CROSS-TIE.

inner and outer slot, provided that their angular arrangement with relation to each other as above described is preserved. On these beds at each end of the tie are placed the locking-plates 10, these plates being provided with a flange 11, adapted when the plates are in place to bear against the vertical ledge 4, along the outer edge of the supporting-bed. These locking-plates are provided with one or more angularly-arranged slots 12, which when the locking-plates are in place will form an angle of ninety

degrees with the slots 8 and 9, in the supporting-beds, as shown in Fig. 2. These locking-plates are placed on the supporting-beds with their flanges bearing against the vertical ledges and with their slots 12, directly over the slots 8 and 9, in the beds. Through these slots are passed the bolts 13, having a head projecting on one side only, and having a squared portion immediately above the heads, the remainder of the bolt being round, as usual, and threaded at its upper end. After the bolts have been passed down through the slots until the squared portion is below the slots in the supporting-beds, the bolts are turned around ninety degrees, and then drawn up until the head portion bears against the under side of the

Fig. 9.

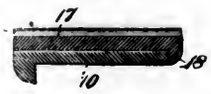


Fig. 10.



GOTTLIEB'S METALLIC RAILWAY CROSS-TIE.

beds and the square portion lies within the slots in the beds. The clamping-plates 14, having one of their ends constructed, as shown, to fit the flange of the rail, are then slipped over the bolts 13, the rails having been previously placed on the locking-plates, as shown in Figs. 1 and 2, and are then secured in place by the nuts 15. The bolts 13, may be made with only a side head, as described, or a T-head may be used. This is simply a provision whereby to insert the bolts in place from above, but where this is not deemed necessary, as in bridge ties, any suitable form of head may be used.

It will be observed in referring to Fig. 2 that by sliding the locking-plates along the supporting-plates a considerable variation in the position of the rail can be obtained. It will also be observed that any spreading action will tend to force the bolt 13, in direction of the arrow x; but as the bolt cannot move in that direction the outward pressure or force will be resolved with two forces, z and y, one tending to move the bolt along the slot in the supporting-bed, and the other to force it against the side of the slot at right angles thereto; but its tendency to move in the direction z, will cause it to bear at right angles against the slot 12, in the locking-plate and move the plate transversely across its supporting-bed, which movement will be prevented by the flange 11, being against the vertical ledge 4. These locking-plates may be formed by rolling between suitable rolls, and the blank thus rolled is then cut off into suitable lengths; and these locking-plates are then slotted, as shown, in a suitable manner; or these locking-plates may be cast in suitable molds, the slot being formed by a core in the molds. The locking-plates employed in securing the rail at one end of the cross-tie are made for straight lines of track exactly alike; but in placing them in the tie they are arranged end for end, as shown in Fig. 2.

In laying curved tracks the locking-plates are formed wedge-shaped in order that the rails resting thereon may have the requisite inclination for such curves, as shown in Figs. 5 to 8.

By reference to Figs. 5 to 8 the following differences in construction will be observed: The locking-plate shown in Fig. 5, having the slot 12, formed in its thin end, is adapted to be used in connection with the outer slot 9, in that end of the tie which will support the inner rail of the curve, and the plate shown in Fig. 6, having its slot in the thick end, is adapted to be used in connection with the inner slot 8, at the same end of the tie. The plates shown in Figs. 7 and 8, having their slots in the thin and thick ends, respectively, are to be used in connection with the slots 8 and 9, in that end of the tie which supports the outer high rail in the curve.

In order to adapt the wedge-shaped locking-plate for different points in the curves, or for the varying inclinations of the rails in different parts of the curve, a series of angular slots are formed along the plate, thereby providing by the simple longitudinal adjustment of the plates for the varying inclination of the rail—as for example, at that portion of the curve where the inclination of the rail is greatest the slots in the locking-plates which are nearest the highest portion of the plate are brought in line with slots 9, arranged along the outer line of the rails, and the slots in the locking-plates from the high portion of the plate are brought in line with the slots 8, arranged along the inner line of the rails. By this arrangement the rails are supported on the highest part of the locking-plates, and as the inclination decreases each way the locking-plates are so adjusted that the rails will rest on lower portions successively, the slots next adjacent to those employed at the point of greatest inclination being brought in line successively with the slots 8 and 9, in the cross-ties. In place of forming these wedge-like locking-plates in one piece, they may be formed as shown in Figs. 9 and 10, in which the locking-plate proper is made of uniform thickness, and on this is placed the wedge-piece 17, having a flange 18, to lock over the edge in the locking-plate to retain the wedge-piece in place. The cross-ties may be made of any desired length to adapt them for use in narrow or broad-gage or for switches or sidings.

In place of forming the cross-ties with double seats, they may be formed with a single seat, in which case the outer slots 9, would be formed in one cross-tie, and the inner slots 8, would be formed in the next cross-tie, and so on in alternating order; or the cross-tie may be formed with a rail seat or bed sufficiently broad for the reception of two locking-plates side by side; and in place of securing the locking-plates as against transverse movement by the flange above described, the same end may be effected by forming a longitudinal groove along the beds of the cross-ties for the reception of a corresponding rib or projection on the under side of the locking-plate.

In using above-described cross-tie and locking-plate it is preferable to place a washer of rubber, leather, or other suitable material between the locking-plate and cross-tie, thereby affording an elastic seat for the rails and preventing the access of water between the parts, and in place of forming the cross-ties by rolling, as above-described, they may be cast, if desired, in which case the braces 7, may or may not be formed integral with the tie.

It is not absolutely essential that the system of slots described be employed at both ends of the tie, as the slots may be made at one end, as described, and the gage being measured therefrom, a non-adjustable means of securing the rail to the other end of the tie be provided at such other end, and if the slots be made a little broader than the diameter of the bolt-shank, or if they be curved, the precise angles designated may be correspondingly varied.

Dibble's Horse-Car Canopy.

FRANK H. DIBBLE, of New Haven, Conn., has invented a canopy for street-cars employing horses as a motive power, the construction and operation of the device being shown in the accompanying illustrative cuts. The object of the invention is to provide a device which, when in use, will protect the horses from the sun and rain, and is readily removed and folded, when it occupies but a small space.

Figure 1 is a view of the canopy, illustrating the mode of attaching it to a car; and Fig. 2 is a plan view of the frame, the canopy being omitted. The reference-lettering is similar in the two cuts.

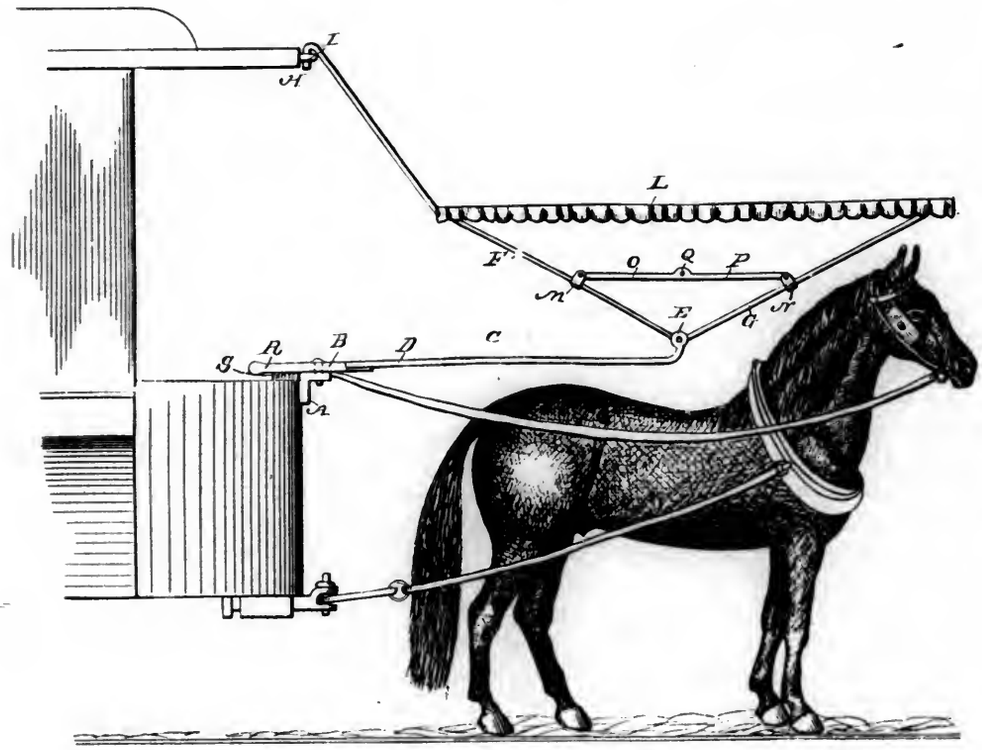


Fig. 1.

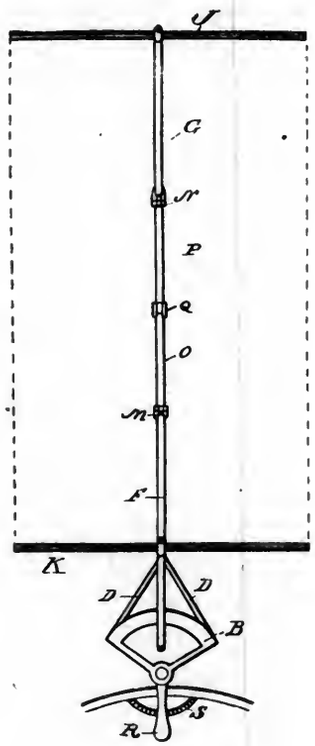


Fig. 2.

DIBBLE'S HORSE-CAR CANOPY.

Secured to the dash-board is the bracket A, to which is pivoted the swinging frame B. To this frame is attached the support-rod C, by means of stays D, and at the outer end of the support-rod are hinged at E, rods F G, the former extending upward and having its end formed into a hook H, which is pivotally held by the staple I. The rod G, extends upward and outward, and has secured to its upper end the cross-rod J, a similar cross-rod K, being secured to the rod F. From the cross-rods J K is stretched a canopy L, of sufficient width to cover the horse. Attached at M to the rod F, and at N to the rod G, are toggle-levers O P, connected at Q. By means of these toggle-jointed levers the canopy is retained in an extended position, or is readily folded when not required for use. Formed integral with the frame B, and extending rearward, is a handle R, the lower edge of which is adapted to engage with the toothed segment S, and thereby be retained in any position desired.

The operation of the device is as follows: The hook H is hooked into the staple I, and the swinging frame is pivoted to the bracket A, when the frame and canopy will be held in the required position by means of the engagement of the toothed segment and handle, as before explained, when the horse is perfectly protected from both sun and rain; and should the course of travel of the horse be changed, the canopy can readily be adjusted to suit such change by moving the handle to the desired position, where it will be retained by its engagement with the segment.

In Fig. 1 the canopy is shown adapted to a one-horse car; but it is obvious that it can, with equal facility, be adapted to a two-horse car. The weight of the canopy is about 20 lbs., and it can be changed from one end of the car to the other in one minute. It can be attached to any car without structural change, and at comparatively small expense.

Beaman's Improved Street-Railway Rail.

T. L. BEAMAN, Superintendent of the Knoxville Street-Railway, of Knoxville, Tenn., has invented an improved rail for street-railways which is herewith illustrated and described. The object of the invention is to provide a rail of improved contour which will combine the principal features of the T-rail usually employed on steam railways, and to combine therewith certain novel features which will provide a rail specially adapted for street-railways.

In the accompanying cuts, Fig. 1 is a vertical transverse section of the improved rail, and Fig. 2 is a section showing the same applied to a street-railway bed. The reference-lettering is similar in both cuts.

A represents the foot of the rail, which is provided centrally with a web B, upon which is formed the head and side flanges C and D D′. The head C is formed immediately over the web, and extends equally from each side of the center thereof. The edges of the head C are curved, as shown at E and E′, and the curve E′ at the inner side of the head is of the ogee order, and terminates in a horizontal portion F, which forms the upper face of the flange D′. The lower portion of this flange D′ is connected by a nearly straight line which is inclined downwardly to the web. The outer flange D, is curved slightly inwardly upon its under surface, as shown at F′, and extends from the center of the web outwardly the same distance as the flange D′, the terminal portion of the flange being on the same horizontal line as the upper surface of the flange D′.

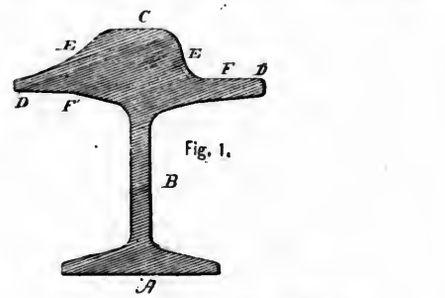


Fig. 1.



Fig. 2.

BEAMAN'S IMPROVED STREET-RAILWAY RAIL.

By the construction herein shown and described, the head of the rail is of sufficient width to receive the tread of the car-wheel, and its flange will run freely below the head. The ogee curve on the inner side of the rail forms an easy angle or curvature, so that vehicles may pass over the same. This curve also enables the flange of the car-wheel to remove readily any accumulations of ballast or earth that may collect upon the flange. The flange D′, projecting as it does, horizontally to one side, will form a track for vehicles, and will keep the flange of the car-wheel from cutting into the street. The flange D, which projects from the outer side of the head downwardly, makes the head have substantially only one side, and no sharp or abrupt corners are formed, and vehicles are enabled to cross the rail at any angle. The under side of the flange D unites with the web at a point somewhat higher than its opposite flange, thus providing for the most economical distribution of metal.

Center-bearing rails as heretofore constructed have two sharp or abrupt corners, against which the wheels of vehicles come in contact with and slide along, making ruts adjacent to the rail, and as one side only of a rail head is used by passing cars, they have thus formed an unnecessary obstruction in the streets. By providing the head with the beveled side or flange D, as shown, this objection is obviated in the present invention, and vehicles are enabled to cross the rail at any angle. By providing the head of the rail immediately above the web the pressure is distributed equally upon the foot, and no side pressure is exerted upon the spikes which hold the foot to the cross-tie.

The manner of laying the rail and the position of the head and flanges with respect to the surface of the street is fully shown in Fig. 2, and when the tracks are thus laid the wheels of vehicles in passing along either edge of the flanges will have a tendency to pack the ballast under the flanges, in the pockets formed above the foot and to each side of the web, and retain the rail in position, it being evident that as soon as these pockets are packed with ballast the rail cannot be out of place, so that even after the cross-ties have decayed the rail will be retained in position, and can only settle with the surface of the street.

This rail, as described, can be rolled weighing 40 lbs. per yard and upwards as required, and careful estimates show that the cost of laying a track with this rail will be but little above that of laying it in the usual manner with the flat rail and timber stringers and ties; and allowing for the cost of the incessant repairs required on such a track, it would seem to be more economical in the end.

A New Baggage Check.

A NEW baggage check now in use on the Lake Erie and Western road, which was invented by Mr. G. W. Smith, general passenger agent of the road, is made of manilla card-board, with four coupons. The numbers of stations appear on local checks, the route with names of principal stations on the terminal road being printed on through checks, and the destination is indicated by marks through the numbers or names of stations. The first coupon is for the passenger, the second is receipted by the train-baggageman for the agent, from which he makes his record. The third is retained by the train-baggageman and acts as a way-bill accompanying baggage to destination. The fourth, containing the name and address of the owner, is inserted in a brass shell (which is peculiarly adapted for the protection of the card check) attached to baggage by the usual strap.

The coupons show the number of train and date forwarded, time received and delivered, and are intended to take the place of reports of baggage forwarded, received and delivered, way-bills, excess baggage and storage blanks, thereby reducing expense of blanks and economizing labor.

The advantages claimed for it are that it will give an opportunity to each road to furnish its own through checks at less cost and labor for station and train-men than any where a complete record is kept and reports required; that it gives a duplicate of each check to the passenger, showing where the baggage is checked from and to, number of train and date on which forwarded, and route over which baggage is to be transported; and that it is a guide to train-men in putting off baggage, preventing the straying of baggage, as the coupons show the responsibility of any error either in handling baggage or collecting charges.

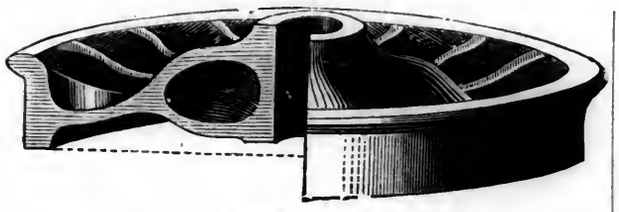
The check has been in use five months, and has given entire satisfaction in the handling of baggage, besides an increase in earnings.

NEARLY 300,000 patents have been issued by the United States Patent Office, of which 3,508 are classed under the head "railways," and 3,505 as "railway cars." Of the 7,000 patents thus indicated, probably one-half apply to car-couplers, and still inventors are at work.

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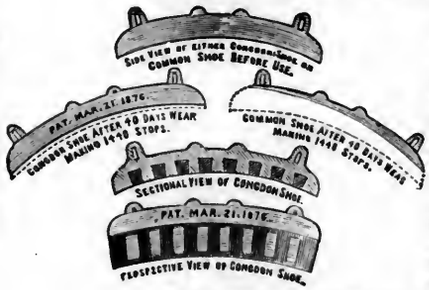
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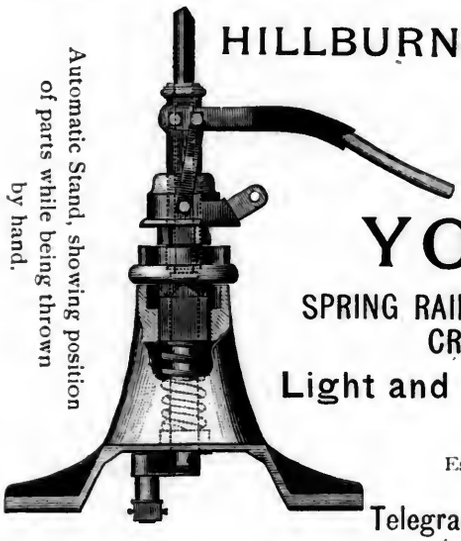
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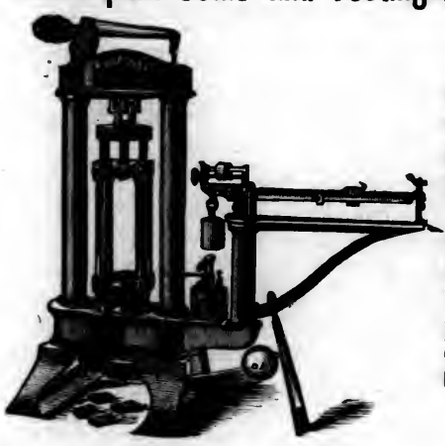
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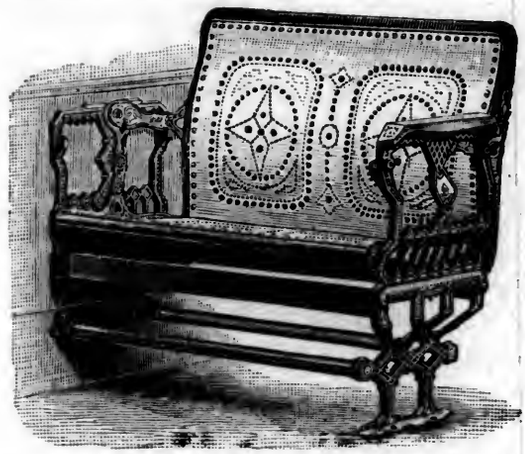
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American Railroad Journal.

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TO ST. LOUIS, VIA NIAGARA FALLS AND DETROIT.

BY CHARLES H. E. REDDING.

[Written for the AMERICAN RAILROAD JOURNAL.]

ALL roads lead to Rome. A glance at a railway map would go far toward convincing the untraveled that St. Louis was the original site of the Holy City. It has often occurred to the writer that he should like to be able to lay aside the cloak of sophistication that envelopes him as a burnoose does an Arab, and feel all the free, untrammeled delights of the man who takes his sentimental journey for the first time. Imagine such an innocent abroad, by the usual chance wandering into the offices of the Wabash Route, on Broadway. The suave and genial H. B. McClellan will lay before him the most attractive array of choice routes to the West, and a great big black line labeled "Wabash," will be sure to indicate the most direct trail to any spot in the land of the setting sun. The sentimental wayfarer being an American, and no fool, is thankful for the information and for the "folders," with which his coat pockets are by this time fairly bulging. He probably goes directly home, muttering on his way "Wabash Route," as if it was a name to conjure with, and, having gained his harbor of refuge, proceeds to look over the whole scheme for himself. Just here his tribulations begin; and putting myself in his place, I shall try to imagine and enjoy his perplexities. It is no fun being well and wisely posted. It must be as delightful as a girl's first proposal to feel the flutter of uncertainty that is sure to affect one when scanning those fearfully and wonderfully made railway folders for the first time. You look at the time-tables; you think they are simple, because the figures are so neatly placed in trim columns. The first snag is the mixing up of the a.m. and p.m. This you find as interesting to solve as a Chinese puzzle, and, finally, after numerous trials, you conclude that you have got the wrong idea, and that these interesting figures are not meant to be a time-schedule, but a table of logarithms compiled for astronomical purposes.

It then affords a much needed relief to turn the whole thing inside out, and gaze on the handsome map of your native land that you now have an opportunity of enjoying. But you wonder why it has been thought desirable to tie down the States of Ohio, Indiana and Illinois so securely with black lines, until you learn that these are all roads trying to get to St. Louis—with more or less indirection. At least it would so seem. It does not require more than a week of hard study for you to conclude that you might as well attempt to read the hieroglyphic obituary on the tomb of Thotmes II., as to decide how to go to St. Louis with the information in your possession. You wisely give it up. A friend says, "St. Louis, eh? Well, I should try the new route, *via* West Shore, Grand Trunk and Wabash." This strikes you as the clearest-cut piece of advice you have yet had, and you conclude it is good. Going back to your "folder" you find, after painstaking search, the tracing of this route, and you begin to wonder how what appears to be the longest way round can be made a fast route. Not being a member of the Geographical Society, and having no familiar knowledge of Mercator's projection, you conclude that it is easier to know nothing, and take everything for granted; and then there is Niagara Falls!

A sentimental traveler, to enjoy a journey, must be an impressionist. Little recks he that he is riding on a seven or seventy-pound-to-the-yard rail. If the locomotive has the proper amount of shining brass, and the cars are upholstered and decorated in a way to please the eye, he is blissfully ignorant as to whether he rides over a 42-inch paper wheel or any other modern improvement. On the West Shore he admires Hudson river scenery, he is enraptured with the Arcadian aspect of the Mohawk valley, and he arrives at the Suspension Bridge with his eyes wide open for new impressions. He has heard all about the Suspension Bridge, of course. As the train is pulled across very slowly, he has a fair view of the falls and the bold scenery of the Niagara river at this point. If he is wise, he will stand on the rear platform of the car, and make alluring advances to the brakeman. This functionary is a man choke-full of desirable information, added to a pleasing and polite willingness to impart it to those who put sensible questions.

Turning from the upper to the lower side of the river, he sees the wonderful whirlpool and rapids. There are two centers of tremendous activity in this country, the whirlpool and Wall street. To fall into either is equally disastrous to the outsider. Thousands can tell about Wall street; only one man, Captain Webb, could have told about the whirlpool. His last thought before he disappeared below the vicious, seething waters must have been, "What fools these mortals be."

Just above the Suspension, is the much-talked-about cantilever bridge. There is a good deal of intentional misrepresentation concerning this latter structure by those active passenger agents whose imaginations are too vivid. One is sure, from the descriptions, that it is much nearer the falls, and that from it the finest view can be obtained; whereas, a biscuit could be tossed from one bridge on to the other, and it is only from the Suspension structure that you can see the whirlpool and adjacent points of interest at all.

Having crossed the bridge, and had yourself properly inspected and labeled by customs officers, you fall into the courteous hands of the Grand Trunk officials, and start on your journey across the Queen's land. There are few pleasanter rides. At Hamilton you enter a

charming city, whose site on Lake Ontario is picturesque to a degree. The people, too, claim your attention. The interest lies in the contrast with what you have so recently left behind. It seems quite in keeping that the train should stop at London on the Thames for luncheon, and after having partaken of a really admirable meal, served by the most buxom red-cheeked lassies, you have ample time, being a real bad man, to step into the café and purchase a flask of excellent French brandy at a ridiculously low price. You begin to appreciate British institutions, and from the smooth and rapid progress of your train feel that those Grand Trunk fellows know how to run a railway. Even Chatham has its coffee-colored attractions, as you can see by the shoals of negroes that cluster about the station. You are passing what was, in *ante-bellum* days, the Mecca of runaway darkies. Windsor, opposite Detroit, the terminus of the Great Western division of the Grand Trunk, is not yet, alas! provided with its castle, but you have little time to regret it, as your attention is absorbed by the antics of a shunting engine that is pushing your car aboard a large steel-built ferry that takes eighteen cars at a load. Now for a delightful sail of a couple of miles down the beautiful Detroit river, with a panoramic view of Detroit on the one side and Windsor nestling on the opposite shore. Your chief regret is that you are not rigged with eyes on the port and larboard sides of your head, so as not to miss any of the view.

From Detroit the Wabash takes you in charge and puts you down at East St. Louis. You cannot conscientiously say that, at this stage of the journey, the picturesque lies around in too great profusion, but as you traverse this stretch of country mostly during the night and at a howling rate of speed, there are compensations.

Let us see now. We have left New York at eight in the evening, and at half-past eight the second morning we are projected into a cloud of soft-coal smoke, and you know we have reached our destination. But this great steel bridge has yet to be crossed, and you are alert to see all there is to be seen. I understand that Jay Gould, through the Wabash, now owns or controls this bridge. That is why it is called the *steel* bridge, peradventure. The traveler does not get a very satisfactory view of the bridge. He is trundled at slow speed through the center of the gigantic arches, and between the openings he sees the swift, muddy Mississippi swirling beneath him. The run through the tunnel is short, and soon he is poured out into the great stream of passengers that makes the Union Station at St. Louis one of the most animated places on this continent.

His journey is ended, and he has no doubt had the pleasantest of trips, if his observation and fancy have been equal to his opportunities. But there are the delights of retrospection. No genuine sentimental traveler would forego these. There are the pleasant recollections of the dining cars, which on both the Wabash and Grand Trunk are a near approach to perfection. He remembers well, when discussing his breakfast of prairie chicken, good coffee and other things, that he thought if he was manager he would have all trains run only twenty miles an hour during meals, and make up the average at other times. But everyone knows that managers cannot manage their roads nearly so well as the passengers who patronize them. A ride in a smoking car, among the old and seasoned travelers, will clearly prove this. At any rate our traveler is supposed to be a reasonable man, well content with most things as he finds them, and feeling sure that for comfort and speed the route described is excellent, and not easily surpassed. Fancy how this feeling must be intensified, if our traveler is a dead-head!

THE LOCOMOTIVE OF THE FUTURE—INSIDE VS. OUTSIDE CONNECTIONS.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

It is related that many years ago, before railways were known or much heard of, a party of Congressmen were on their way to the "city of magnificent distances" through Pennsylvania, in a stage coach, when their conversation turned on their slow and tedious journey. One of the members, who had learned of what was being done with railways in England, and with some that were struggling for an existence in America, remarked that there were passengers in that coach who would ride among those hills in steam carriages, at the rate of 15 miles an hour. His companions laughed at the idea, and he was the butt of many jokes, and the subject of much merriment for the remainder of the journey. At times, the matter was discussed in all seriousness, but was regarded, on the whole, as a visionary and impracticable scheme. This has been mentioned here to illustrate the progress of American railways, and to prove the statements of the writer, made twenty years ago, that a speed of 100 miles an hour could be made if demanded by the traveling public. When the speed of 15 miles an hour was reached it was considered an engineering triumph, and the people were satisisfied; but when 20 miles was covered in one hour, there was a demand for higher velocities, and 5 and 10 miles an hour were added from time to time; and when 50 miles an hour was reached it was as unsatisfactory as was the 15 or 20.

The predictions of the "cranky" M. C., were more than reached, and some of the party have lived to see 60 miles covered in 60 minutes as a matter of every day business, and on extra occasions 90 miles an hour has been recorded for short distances. On one road, (the Michigan Central) 111 miles are run in 109 minutes as a regular every day speed, and the motive power is not considered the best in the country, although the grade and alignment, and excellent condition of track on that road are favorable to high velocities. Although some improvements in the locomotive will be needed to bring the speed of trains up to the requirements of a fast people, yet much will need to be done by way of reducing grades and curves, and other changes in permanent way.

When it was predicted that a speed of 100 miles an hour would be reached in the near future, it was stated that the locomotives would not undergo any startling changes, but would remain substantially as they were then. Improvements would be added from time to time, and perfection would be reached by improvements in detail, and not by any change of general form or outline, or the introduction of any new principle. Since that time several attempts have been made to improve the locomotive by radical changes in general form and design, but have resulted in failures, as the "Fairlee," "Fontaine," and

others, and the general outline of the best locomotives of the period remains substantially the same as a quarter of a century ago.

While it is true that as the locomotive stands to-day it is much nearer perfection than formerly, the fact remains that some good points have been overlooked or left by the wayside in the general march of railway progress, and strange as it may appear, the readiest way to bring the coming locomotive up to the required standard of excellence is to "advance a step backward" and gather up some of the good things that have been unwittingly left behind.

As the requirements of traffic have called for improvements they have been promptly supplied. When we were in need of driver and train brakes, injectors, lubricators, and the thousand and one details, they have taken their places, and but little remains to render the locomotive a perfect machine. Some of the performances of modern locomotives are remarkable, but when compared to others of twenty-five years back and comparing their proportions, it impresses one with the idea that there is a mistake somewhere. In comparing the diminutive fire-boxes, boiler capacity, weight on drivers, etc., and their performances, with the present engines of monstrous proportions, it would seem that dimensions have increased in greater ratio than capacity.

But laying aside the matter of proportions, the principal matter to be considered here is the *style* of engine best adapted for the fast work of the future, and when the general design is decided upon, the details can be readily worked out by any mechanic who has had experience in adapting locomotives to the work expected of them. In the earlier days of railroading a locomotive was a locomotive, and was not designed for any special service. It was a machine of all-work—a general utility machine, built for yard work as well as for freight and passenger service. As traffic and mileage increased it was found necessary, or rather desirable, to have engines designed especially for yard work, others for freight, and a different type for passenger service, and the two latter classes were designed with reference to grades, curves and nature of traffic. On lines that were located partly in a level district, with easy curves and other divisions in hilly or mountainous regions, the engines were built with reference to the particular division on which they were to serve. With all this experience it would seem that railway mechanics will encounter no insurmountable difficulty in furnishing locomotives that will "create remoteness" in a style that will be eminently satisfactory to that large class of the community who yearn for unreasonably high velocities.

Although it is possible to cover 100 miles an hour, it is hardly desirable save for a few, comparatively, whose wants can never be satisfied in any direction; yet there is an urgent demand for a great reduction of time between business centers, and the business public are ready to support much faster trains than are now running. But it is not necessary for designers of locomotives to get "cranky" over the matter, in the common acceptance of the term, though doubtless if they will return to the crank axle that was discarded by "cranks" years ago, they will be better pleased with the results than if they had brought out a monster, new in design, and unmechanical in principle, and a failure theoretically and practically, like many that are now in the scrap-heap. Some of the best performances of American locomotives were made by those with inside connections. This style gradually went out of use here, but is still doing the fast work on English roads. The liveliest work on American roads was formerly done with the American "8-wheelers," inside connected, and they were universal favorites on all roads where used. But the frequent breaking of crank axles was considered an objection for which there was no remedy known nor sought for at the time, and they gradually went out of use. But the axles were smaller than they should have been for the strain imposed upon them, and in forging them the fiber was weakened, and the material was not always of the best quality, and tracks were in bad condition, and all this, together with severe cold, caused frequent failures of crank axles, and when they were laid aside the mechanics fell into the groove of outsiders, where they remain. All the causes of frequent breakages have been removed, save low temperatures, and there is now no reason why that style of axle should not be revived. Of course the old prejudice still exists, for the same reason that a man may experience a genuine reform, yet a feeling of distrust always hangs over him. We now have better material for axles, a process of forging that does not impair its strength, and more correct ideas of proportion than formerly, and if a trial were given now it is tolerably certain that the fast locomotive of the future will have the present outline of the 8-wheel type, with inside cylinders. It is a well known fact that the outside connections are more destructive to permanent way, bridges, and to themselves than insiders, and as a matter of speed, safety and comfort, as well as economy, it is safe to say that the coming locomotives will be substantially those of the present, with the changes suggested herein and some others of minor importance.

"TOWN BUILDING."

BY THOMAS R. WENDELL.

[Written for the AMERICAN RAILROAD JOURNAL.]

I DO not suppose that there are any railways in this or in any other country possessing a special department of management devoted to "town building," and yet there is no branch of railway management requiring so keen an insight into the possibilities of the future as would this imaginary department. The average railway at the inception of its career, and during the early years of its operation, must pass through wide territories which are in a great measure thinly inhabited. In the case of a trunk line between two great centers, where directness of route and consequent quick time is called for, the greater is the proportion of uninhabited territory, for the advance of habitation is sinuous, and for a railway running a distance of a thousand miles to pass through the chief towns intervening between the termini would require it to be constructed on a most devious and tortuous plan.

It is to be presumed that when a line is laid out between two great cities some distance apart, and where directness of route is demanded, many questions as to the exact route of construction are brought up for consideration. The topography of the country is carefully studied, and the road is laid out as closely as possible to an air-line, while at the same time advantage is taken of the natural

features of the country and a level path chosen as near as practicable. To some extent also, the route is laid out with reference to the chief intervening towns, but the consideration of this question is greatly limited. Short deviations to embrace large towns are permissible, but when such a deviation must needs be one of a hundred miles or so, the through traveling public naturally object.

In every case of railway construction, it is fair to presume that the road, if it be a long one extending for hundreds of miles, will pass through territory in every way suitable for the growth of towns. Especially is this true in the sparsely settled districts of the West, where thousands of acres, fertile in their resources, are awaiting the presence of the settler for rapid development. This country must be traversed by railways, and in no way can the revenue thereof be more advantageously increased than by the growth of towns along the line. Possibly in the early days of railways the prior existence of towns was the *sine qua non* of railway construction, but the lapse of time has changed all that, and now the prior existence of railways is the *sine qua non* of the growth of towns.

Bearing this in view, it is evident that the development of the territory along the line of a railway is one of the chief duties of management, and one in which skillful foresight is called into action. Every point of road must be examined for its possibilities of development; and fertility of soil, salubrity of climate, the supply of water and the proximity to other settlements and towns, are questions of great importance. Having selected points on a line of railway where every indication is favorable to the growth of a town, fresh energies must be brought into play to promote its progress. A tasteful station must be erected, a train accommodation furnished, not alone adequate to the needs of the few early residents and only warranted by the actual traffic, but an accommodation that in itself will be an inducement for an increase of population. To what extent the railway itself should indulge in real estate speculation is another question entirely, nor is it essential that it should be entered into at all. Sufficient profit will await the railway in the patronage from the town, without an actual ownership interest in the property. To the owners of large and undeveloped tracts of fertile territory, the railway should offer every facility for the colonization of a few families as the nucleus of a town, and nothing is more certain than, if such a town is once established under favorable conditions of soil and climate, that its development is sure to follow. America is a colonizing nation, to say nothing of the hordes of emigrants that are constantly seeking new and inexpensive homes, and more than a thousand towns at present bear testimony to the power of railways in not only promoting the growth of towns but in absolutely creating them.

When practicable it would also seem advisable for the railway to select some promising undeveloped site along its route for the establishment of its road-shops, for this alone would necessitate a settlement. The laborer and mechanic would be followed by the tradesman, and he in his turn by the professional man, and thus the necessities of the railway can of themselves be employed as promoters of town growth.

The possibilities of town building are doubtless greater in the West than in the East, but even in the immediate vicinity of our great Eastern cities much can be done by the railways in the way of fostering the development of suburban towns designed as residences for those doing business in the cities. Much in this direction has been done, but there is room for much more, and here more especially do the questions of generous train accommodation and low fares come actively to the front. Many present residents of a large city would prefer to reside a dozen miles away from the scene of their daily labors, could they do so without being burdened with high fares and harassed with the knowledge that they are tied down to the use of a few trains run at infrequent intervals. Could they, for instance, be furnished with one-tenth the facilities that are now given the residents of upper New York City, it is highly likely that they would avail themselves of the opportunity for an early migration; but the small suburban towns accessible at frequent periods of the day and evening are rare. It is safe to say that within a radius of twenty-five miles from New York and other great cities, there are a dozen points on the lines of railways available for the growth of small towns, and sooner or later their development will take place.

The department of town building, therefore, is one of importance in railway management, and susceptible of most profitable conduct. So great are its possibilities, that it may safely be questioned whether a road would not find it advantageous to conduct it separately as a department of management, and accord it far greater attention than it at present receives. Through travel will of necessity always take precedence in matters of railway management, but with through traffic almost invariably comes competition, while in the development and encouragement of local towns and the consequent increase of local traffic, there is a snug little field of monopoly opened, that may be profitably entered upon and successfully increased.

DURABILITY OF PAINT ON PASSENGER-CARS.

BY E. HARTSHORN.

[A Paper read before the Master Car-Painters' Convention, Boston, Mass.]

SOME time ago our secretary wrote to me, asking me to suggest a subject for discussion at this convention. I chose for a subject "The best method of painting a passenger-car, durability considered," but I see by the programme it has been changed to "How can we improve the method of painting a passenger-car, durability considered." Now, gentlemen, I hardly know how to answer this question, but will introduce the subject by throwing out a few hints or suggestions, which, if put into practice must be a benefit to the durability of paint on a passenger-car.

In the painting of a passenger-car the first thing to be considered is durability, and without that the job is a failure, no matter how well the car may look when it leaves the shop. I know of no fixed rules that could be laid down as to the time between coats of paint on a passenger-car, as it depends much upon circumstances; say, for instance, the priming coat will dry in six days and if the weather should be unfavorable for the drying of this coat, it should stand longer, until it is dry. Right here I

would say that much depends upon this foundation for the durability of the job; it must be dry to receive the coats that are put on over it, and the painter must use his own judgment in this respect. What I mean by dry is that the first coat of priming must have time to harden so as not to crack the less elastic coats put on over it. We might paint a car very quickly and even carelessly, and if it was housed and kept from the weather it would stand for a good many years, but our work is called upon to stand the severe strain of heat and cold, shrinking and swelling of the wood, vibration and twisting of the car, therefore it requires good stock, rightly mixed, and a careful application of the same.

What I have said about the first coat of priming will apply to the second coat, as this is put on for the same purpose, to make a foundation to build upon. For a foundation I use raw linseed oil and lead, and if properly mixed, properly applied and time given for it to dry, I know of nothing better. I mix my first coat of lead, three parts oil, one part turpentine, mix quite thin, using to assist it in drying, one gill of japan gold size; give a good free coat and lay it on evenly; for a second coat, four parts spirits of turpentine, one part oil, one gill of japan gold size. I use this coat a little heavier than the first coat. Special care should be given to the spreading of this coat; should avoid putting a full brush of paint at the head of the panels, and at the side of the batten, for there is where paint generally commences to crack; next to the batten or under the window stools. This second coat should be well worked into the nail holes. My putty, I make three parts dried lead, one part ground lead, mixed with three parts japan gold size, one part rubbing varnish: stiffen it with whiting. I have no trouble with this. Among painters, the methods differ from these coats; some use rough coating and rub with block pumice stone. Others use a scraping filler, and as our cars are of a light color, as a matter of economy, I use a scraping filler. I give it the preference on that account.

I don't think there is any difference in the wear, for there is very little of either left on the car except in low places. If my cars were dark color I should rough coat them to get a better surface. Next, as to color, there is a difference in this. Some use the color ground heavy in oil, with a little japan, and others grind their colors in japan with a little oil. I use keg lead and chrome yellow. Care should be taken that the lead is not ground too thin in oil. I prefer this for straw-colored cars. I stripe, letter and ornament on the flat color. I think this is the best way for a number of reasons. The letters and ornamenting get the benefit of two coats of varnish and the paint gets the advantage of the time to dry while the work is being done. By some there is an objection to this method of finishing on flat color on account of staining the color by the hand of the workman. The remedy for this is to be careful. There is but little cleaning of the car when we get it ready to varnish. For the first coat of varnish I use a medium drying. I give this the preference. I don't believe in using two coats of wearing body varnish as quick as we have to use them. The same rule applies to varnishing as to painting. One coat should be dry enough to receive the coat put on over it. I know some painters say that varnish is very penetrating, and will unite and become one with the coat of varnish under it, but I don't see it after the under coat has been three or four days in drying. If I entertained that theory, I should varnish just as quick as I could, say within twenty-four hours. Now I believe the cracking on cars can sometimes be laid to this method of varnishing too quickly; if not I should like to have some painter tell me the reason of varnish cracking on our bay-wood doors and cherry sash as it sometimes does, where there is no paint, and nothing but one coat of oil. In conclusion, I would say our method of painting, durability considered, may be improved by giving more time and care to our foundation coats of paint and protecting coats of varnish.

THE UNION PACIFIC AND THE GOVERNMENT.

THE relations of the Union Pacific Railway Company to the government seem to be very little understood. The Union Pacific Railway Company, as a consolidation of the Union Pacific Railroad Company and the Kansas Pacific Railroad Company, is a corporation owing the government, according to the government's own figures, $33,000,000, advanced for the construction of portions of the 1,821 miles constituting the main lines of the Union Pacific Railway, and $17,000,000 for interest upon this indebtedness. It would have owed twice this amount for interest, had not the company repaid the government $16,500,000 by transportation services and some small cash payments. Now, neither this debt nor the interest upon it is due to the government from the company. The Supreme Court has decided that the interest is not payable by the company until the maturity of the debt, thirty years from the date of the bonds. It is to provide for the payment of this indebtedness, principal and interest, that there has been introduced into Congress the sixty-year refunding bill, which will divide the entire indebtedness into 120 semi-annual payments, interest after the maturity of the debt being computed upon a 3 per cent. basis. This will make a fixed sum for payment, instead of, as at present, certain proportions of the earnings of the company (about which there is a continual dispute), to be applied partially towards the payment of the interest on the debt, and partially toward the creation of a sinking fund to meet the indebtedness at maturity. Decisions from the United States Supreme Court in favor of the Union Pacific Company are of little consequence against the will of Congress; for the Union Pacific, more than any other corporation in existence, is the absolute creature of the government; for its charter reserves to Congress the right to alter or amend it in any respect. When the Supreme Court said that the company need not pay the interest until the principal matured, Congress declared that it should. The Thurman act provided for the application of certain of the net earnings of the company in direct payment of the debt, and for the application of another portion of the net earnings into the treasury of the United States as a sinking fund. It would be useless to state the terms of the Thurman bill, for a brief article could not comprehend them. In illustration of this fact we may remark that four pages of the United States Railroad Commissioners' last report are occupied with the figures of the calculation of what this act calls for from the earnings of 1883. The present result of the application of the act is the payment of about $1,800,000, about one-half in cash and one-half in

government transportation, of which about one-half would go to the credit of the sinking fund and about one-half directly to the extinguishment of the debt. As the payment of interest upon this debt by the government amounts to about $1,900,000 per annum, the Thurman act enforced would keep the indebtedness from increasing.

Now, the policy of the company has been antagonistic to the government, and in part it has been right and in part wrong. When the Union Pacific subsidy was voted, after thirty years of public agitation upon the subject of a transcontinental highway, the construction of a railway across the Rocky Mountains, and not the security for the loan was considered. Neither before nor for some years after the construction of the railway was it expected that the indebtedness to the government would be paid. The 8 per cent. bonds of the company sold as low as 40, and the stock at $10 a share was regarded as of no appreciable value. Nobody thought or cared about the payment of the indebtedness to the government. Until within a few years the directors of the Union Pacific shared the popular sentiment and snubbed the government and its representatives in their attempted assistance and interference in the operation and affairs of the corporation. This was of course resented, and, as the corporation became a prosperous Wall street property, the public and the government soon began to snub in return. The Union Pacific was found able to settle all of its debts, and the officers of the company have finally concluded that they will, because they must.

Now, the Union Pacific has never defrauded the government of a single dollar. It has continually improved the property, which is pledged under a second mortgage as security for the government debt; it has replaced iron with steel; it has populated its own and the government's lands; it has built up a system of 3,000 miles of branch lines, all tributary in traffic to the Union Pacific's main lines, and has thereby raised the gross earnings of the Union Pacific line from Omaha to Ogden, from $7,500,000 to $17,000,000; has invested $36,000,000 cash in $60,000,000 of branch line bonds and stocks, while paying to its stockholders $23,690,000 in dividends, and reducing its rates both for passengers and freight. Its crime is that it has resented government interference. The company rightfully claims that it can make a much better investment of its own monies than can the Treasurer of the United States, who holds $3,000,000 of the Union Pacific's surplus earnings in the sinking fund which does not return 3 per cent. per annum.

The managers of the Union Pacific took a railroad 1,000 miles long, and having a capitalization of $110,000 per mile, and raised it to a system of 5,000 miles, reducing the capitalization per mile to $47,000; of which $15,000 per mile represents the total capital stock outstanding of the Union Pacific and of all its twenty-four branch-line companies, including the Oregon Short Line, $10,000 per mile the indebtedness to the government, and only $22,000 per mile the remaining indebtedness.

The Union Pacific Company has rightfully disputed many of the claims set up by the various departments of the government. It has claimed that compensation due from the postoffice department for carrying the mails was a proper off-set against claims brought against the company by other departments of the government; it has claimed that the investment of its sinking fund, so that it netted at times only one or two per cent. per annum, and the non-investment of a large portion of it, were a great injustice, and that the government should pay the same rates for transportation that other like traffic had to bear.

Every railroad corporation in the United States avoids making lease of contract upon the basis of net earnings, because there is such a radical difference of opinion as to what are the proper "operating" expenses to be deducted from the gross earnings in ascertaining the net. With the Union Pacific Railway Company in dispute with the government as to which shall make the tariff for mail and government transportation, and with a large amount of money being expended each year for improvement and construction upon the subsidized lines of the Union Pacific, the government accountants undertake to say what are the proper net earnings out of which, after deducting the first mortgage interest, 25 per cent. per annum shall be paid to the government. Of course, there is a dispute. The government withholds from the branch corporations in which the Union Pacific is an owner, compensation due for services; the company withholds payments claimed to be due for the sinking fund, and refuses to settle with the postoffice department at rates prescribed by postoffice officials. An adjudication is necessary, and the matter goes before the Court of Claims at Washington. Each side claims from $4,000,000 to $6,000,000 to be due it. The Court of Claims recently handed down its decision, and gave the principles by which all disputes between the government and the company to Dec. 31, 1882, are to be settled. The court finds approximately, according to the associated press report, that the United States owes the company $2,975,700, and that the company owes the government $5,734,392, entitling the United States to $2,758,692 from the railway company, but the court postpones judgment until the accounting officers of both parties make their computation upon the principles laid down by the court, after which the court will enter its decree of judgment. The Union Pacific officers are unable to understand these figures, as their accountant says that the decision will call for the payment to the government of only $1,000,000. The result will arrive in due time; what we wish now to make clear is that this effects a settlement of all financial differences between the government and the Union Pacific from the organization of the company down to the first day of 1883. For the year 1883 the government declared the 25 per cent. of net earnings due it to be $1,809,458, and the cash balance unpaid by the company for 1883 to be $718,814.60, which amount the company under protest, but under threat of adverse legislation, paid into the United States sub-treasury June 24, 1884. The account for the year 1884 has not yet been drawn, nor can it be for some weeks or months. It will probably call for a cash payment of about $600,000 under the operation of the Thurman bill.

What we wish to make clear by the above is that the Union Pacific, while owing the government $50,000,000, which will be paid in the time and manner to be described by the United States Congress, has no enormous sum of money due to and unjustly withheld from the government. No demand has been or can as yet be made for a settlement upon the basis of 1884 earnings, for 1884 earn-

ings are not yet known. Every dollar claimed by the government to be due from the earnings of 1883 has been paid, and the Court of Claims will soon enter final judgment, decreeing the amount to be paid in settlement of all claims up to 1883.—*Boston Transcript.*

THE SYSTEM OF RAILWAY TICKETS.

ANYONE who has attentively studied the face of a railway ticket has observed upon it a great deal more than the average reader can understand, and the natural inference is that the company issuing the ticket has placed upon it certain marks as safeguards against counterfeiters, and means of tracing the ticket from the time it leaves the press until it is sold, and again from the time it reaches the conductor's hand until it is sent to the paper mill and made into pulp which may again pass over the road in the form of a ticket.

Every railway ticket has an individuality which may be unknown to the purchaser, but is at once recognized in the general office to which it must eventually come, if it is used for passage on the road. Tickets are printed in series, each containing either one less than one hundred thousand or one less than a million. Every ticket bears a consecutive number, and in addition to this the number or other distinguishing mark of the series to which it belongs, and the number designating the office to which it was issued. Each office is numbered on all large roads, and a record is kept of all tickets sent to each office. On every ticket purchased at Market street station on the Pennsylvania Railroad, for instance, will be found in small type in the lower left hand corner the figures 3,024, and it is only by this number that the station is spoken of by conductors and agents when talking among themselves.

When a conductor returns from a trip he delivers up the tickets he has collected, and they are at once taken to the office of the company and properly credited to him. They are sorted, and each particular ticket after being examined is thrown into a drawer containing others of the same sort. From this drawer the tickets pass into the hands of the sorters, who are generally the youngest apprentices in the office. They have before them on the table a number of trays each containing ten partitions, The tickets are first assorted in their proper series, and then follows the distribution into the compartments of the trays by thousands. After this is completed the tickets are again sorted from the trays into hundreds, and finally into tens and units, until the number on each ticket is seen and the missing tickets recorded in a book which is kept for the purpose. If a ticket which is recorded as missing from a certain series should come to light after an absence of years, the entry would be looked up and canceled.

This seemingly unnecessary work involves a great deal of labor, as may readily be understood when it is seen that some large roads use as many as three or four different forms of tickets, each of which must be separately considered and accounted for.

On large and important roads great care is observed in making the tickets difficult to counterfeit, and considerable art is used in the preparation of the plates from which the backgrounds are printed, and care is used in the selection of odd type for the letter-press matter. In fact, the tickets are jealously watched throughout their "life," and when they are dead only a bonded dealer in paper stock is entrusted with their removal and final conversion into new paper. It might seem cheaper and safer to burn them, but the quantity of canceled tickets accumulating each month is so great that paper stock dealers are anxious to give bonds for their destruction in a manner that will prevent them ever being presented to the conductors again.

Even a punched ticket is regarded as dangerous by the railway managers, because they have frequently found in their trays tickets in which the perforations made by the conductors' punches have been cleverly filled up with chewed paper, in the same manner that punched coins are plugged with tobacco foil. Another plan that has been selected is the replacing of the cuttting, which is picked up from the floor or seat after it has fallen from the jaws of the conductor's punch. This is very commonly resorted to, and a neat job is generally the result.

Railroad tickets are generally printed upon heavy wood pulp paper, which is cut in strips and first impressed with an engine-turned design in a delicate tint of blue, green or other color. Steel plates are sometimes used, but the usual plan is to engrave the design on brass with the lathe and make a number of fine electrotypes from a copy, which is taken from the brass cut upon "impression metal." This plan gives any number of accurate copies for a design and is much cheaper than using a steel engraving.

After the design is printed upon the strips they are ready for feeding sideways into a special press, which finishes the work by impressing upon them the perforated divisions into coupons, the necessary printed matter and the consecutive numbers. The latter part of the process is very ingenious and interesting, as it involves the use of accurate special machinery in connection with the printing press. The numbers are engraved in strong relief upon the edges of disks, which revolve upon their axis with each impression. Starting with the figure 1 on each set of disks across the press, the numbers steadily grow until the whole series of tickets are run off. When the whole combination of figures are run out a bell gives warning, and the serial letter or figure is changed for the next series, while the figures are in a position to commence again at once.

The perfection of the consecutive numbering machinery is, in a great measure, due to the inventive genius of several Newark mechanics, who in the past thirty years have made great improvements in it. The greater part of the railway ticket machinery in use at present is of Newark manufacture, and much of it was constructed by Mr. W. F. Dickinson, of No. 23 Railroad place. Mr. Dickinson makes several different forms of ticket presses which automatically number the coupons, and also constructs a rapid press which prints separate local tickets at the rate of 12,000 per hour, numbering each one in succession as it passes through. The thick white cards are fed into a hopper which will contain 1,500 tickets, and the only further attention necessary is to refill this hopper several times during the hour.

The numbering wheels used by Mr. Dickinson at present are of solid steel, with the figures cut from the rim by hand. In a cheaper form of wheel which he introduced several years ago, the numbers were simply type inserted

in a brass disk in such a manner that they could be replaced when worn out. This form of machine is still in use, and millions of tickets for the elevated roads have been printed with it. In addition to the ticket printing machinery, Mr. Dickinson makes numbering machines for the government, and it is upon these machines that our bank bills and greenbacks are numbered. He is a builder of engraving lathes also, and as an expert upon bank note engraving he has been called to Washington several times to testify in relation to imitations of the combinations used upon government work.—*Newark (N.J.) Sunday Call.*

Automatic Freight-Car Coupler Tests.

MAJ. CHARLES A. EVANS, of Denver, proposes the following rules for tests of automatic freight-car couplers:

RULES.

1. Basis of perfection, 100.

2. Tests to be made with locomotive and two cars only at a time, on sharply curved track and brakes off.

3. The limit of practicability as to varying height of draw-bars assumed to be three inches higher and three inches lower.

Name of Coupler .....

ESSENTIAL REQUIREMENTS.

1. The safety and certainty with which it will couple automatically with its own kind of the same height .....

[This trial may be made by bringing cars together moderately, also fast and slow. For failure in any case deduct 20.]

2. The safety and certainty with which it can be uncoupled from its own kind and any common draw, also other automatic devices, without going between cars to do so .....

[If necessary to go between cars to pull pin, deduct 20.]

3. Certainty with which it will couple automatically with its kind, lower than itself, without going between cars .....

[On failure to do this deduct 100. If a coupling is made at all, but with any liability to become uncoupled, deduct 50.]

4. Certainty with which it will couple automatically with its own kind, higher than itself, without going between cars .....

[On failure to do this, deduct 100. If coupling is made but with liability to become uncoupled, deduct 50.]

5. The safety with which it can be coupled with common draw-bars of same height, without going between cars until at rest .....

[When the risk in doing this is the same or greater than in coupling two ordinary draw-bars, deduct 100. When necessary to remove link from common draw-bar deduct 25, if by doing so the danger is thereby obviated.]

6. Same as above when common draw-bar is higher than new device .....

[Explanation same as No. 5, preceding, and governed by same rule.]

7. When common draw-bar is lower than new device .....

[Explanation same as Nos. 5 and 6.]

8. The absolute certainty that it will not become uncoupled by unevenness of track or any cause short of destruction of parts .....

[This must be left to judgment of examiners and the basis reduced by 10, 20, 30, etc., as they may determine.]

9. The facility with which it can be set so as not to couple when required not to, as in moving cars in yards and on sidings, etc .....

[If this cannot be done deduct 100. An automatic device that does not provide for this requirement would prove annoying and expensive.]

10. The simplicity and readiness by which it can be fixed so as to couple again without pulling pins or use of springs .....

[This is to be left to examiners and deduction made according to their judgment as in requirement No. 8.]

Total .....

Average of essentials .....

IMPORTANT REQUIREMENTS.

1. Cost including attachment to cars .....

[The average common draw-bar, without springs, is assumed to be $5. For each dollar it costs above $5 decrease the perfection number of 100 by 1. For devices requiring loose link and pin, add $2. For those requiring loose link only, add $1 to cover loss of loose parts.]

2. The facility with which repairs can be made and make-shifts adopted in case of accidents .....

[This and the three following requirements will be divided into Good, Inferior and Bad and rated respectively at 75, 50 and 25.]

3. Non-liability of obstruction of parts by dirt, snow and ice .....

[Same rating as above—Good, Inferior, Bad.]

4. Ability of device to resist injury from concussion, any incident of use and carelessness of train men .....

[Same plan of rating as above—Good, Inferior, Bad.]

5. Adaptability of coupling with all automatic couplers that will couple with the draw-bars now in use .....

[Same rating as the three preceding requirements.]

6. Uncoupling when necessary with the least amount of slack .....

[Slack of 1-16 inch perfection. For each additional 1-16 inch required lessen by 10.]

7. Certainty of knowing which car to uncouple in the dark .....

[In some cases this is difficult without trial, in such cases rate at 50.]

Total .....

Average of important requirements .....

Grand total .....

Average of all requirements .....

Railway Pools Cause Rates to Decrease.

THE fact that railroad pools decrease, remarks the Chicago *Journal*, instead of increasing, the average cost of transportation, does not seem to be thoroughly understood. When there is a railroad war between independent lines, rates for through freight and passengers are sometimes cut to a very low figure. But this is never more than a temporary and local advantage for the general public. Such sharp reductions are made only to a few competing points; they occur only at periods when but a small proportion of the business or traveling public can avail themselves of the concessions in their favor; prices are kept up fully as high, or they are forced to a higher rate, at all points; a return to regular prices is always by a violent process involving surprises, disturbances and losses in business.

When a pooling contract is perfected between railroad companies, the necessities of the case require that prices under the contract shall be lower than prices with the contract. Railroad managers are sagacious, and they appreciate to its full extent the ruinous impolicy of exciting against themselves popular jealousy and hostility. They understand the aversion in the popular mind against combinations between great corporations to fix schedules of prices which the people must pay. They are aware that to secure toleration for a pooling contract they must

make lower instead of higher prices to the public. There is nothing which the managers of the great corporations as much fear as an agrarian uprising against the unequal distribution of property. They are always, as a rule, ready to conciliate public sentiment, and are never desirous of offending it. This wholesome fear will almost always be sure to regulate pool prices.

On the other hand, rival corporations are always suspicious of each other. They are afraid of losing business by the trickery and bad faith of their competitors. They therefore fix low pooling prices in self-defence, and to restrain each other's greed. If high prices were fixed, the pool would not stand a week, for all its members would be cutting under the pool rates. There is no security whatever for pool rates that are fixed so high as to yield more than a living profit, for if the rival lines can do the business at a profit for less than pool rates, they will make any rates separately that they find necessary to get more than their share of the business.

These are not high motives of action, but corporations are not impelled by high motives. They are greedy, selfish and cunning. Guided by no moral law, they have no conscience to restrain their acts. But their acts are restrained by what is to them a higher law than conscience—the law of fear and suspicion; fear of public sentiment and suspicion of each other.

Car-Windows.

THERE has been some complaint of late, says the *National Car-Builder*, about the small size of car-windows, both on street and steam roads. The windows of the East River Bridge cars are more particularly objected to on this account, for the reason that people who cross in the cars desire to get as unobstructed a view as possible of the scenery up and down the river. During the hours of heavy traffic, morning and evening, many of the passengers have to stand up, and cannot get a fair look at things outside without stooping. The street-cars in Philadelphia have small windows, and many of these have ground glass at the top. On steam-roads, the old, small-sized windows are going out of fashion, and even the larger windows of cars that have been constructed more recently, are none too large to suit the great majority of people.

Some car-builders have tried to remedy the evil by putting in glass of a very large size, the advantage of which is not fully secured, in consequence of the double blinds with a short lift, which are so generally used. These blinds restrict the view to that portion of the glass that remains uncovered, and the peculiar discomforts incident to large sizes of glass are retained; that is to say, leakage of air and radiation, the latter being so great with large glass as to create the impression that the window is not tight. In cold climates, a double sash is indispensable for large windows, for without it the discomforts arising from increase of size would more than offset the benefits.

Curtains are much to be preferred to slat blinds; not the old style of curtain, swinging loosely at the bottom and flying up to the top of the window, but one with a rod at the bottom of it, with a head to keep it from flying about. The material that is now most used for curtains is a kind of cloth called raw silk; but it has several disadvantages. The right kind of material should evidently be leather, or something that will keep smooth on both sides and not collect dust; or, to go a step further, something that a passenger cannot pull down to the level of his own eyes, regardless of other people who want to see out. It is manifest that no device of invention can remedy this state of things, or change the quality of pork on the hoof when it stands on two legs.

American City and Town Nomenclature.

CITY and town names in America formed the subject of a recent lecture by the Hon. David Dudley Field, before the American Geographical Society. On this side of the ocean important changes have occurred. The peninsula next east of this country was once Acadia. It is now Nova Scotia. Upper Canada has become Ontario. Little York is now Toronto. The Territory of Washington is about to be changed into the State of Tacoma. Would that New Mexico might be changed to Sonora, and New York to Manhattan. It is not extravagant to say that there is not another country on the face of the earth disfigured by so many inappropriate names as this country. England has English words of Saxon and Norman origin. Holland has those which are wholly Dutch. France has her own, handed down from the Franks. Germany and Switzerland have names which are histories. Russia and Poland have at least names that are significant to the Slavonic races. Here it seems as if there was nothing appropriate to the soil; nothing to distinguish this new country from the older ones. In this country there are towns named You Bet, Popcorn, Wild Cat, Cub Run, Cut Shin, Bake Oven, Big Coon, Burn Corn, Rawhide, Cat Creek, Dirt Town, Doctor Town, Ivy Tavern, Cut Off, Big John and Fish Hook. The name of the old Assyrian capital has been assumed by a straggling Long Island village, and a new settlement on a low tongue of mud thrust out between the Ohio and Mississippi has been named after the seat of the Egyptian kings, and, as if to lose nothing grandiloquent from the land of Egypt, a Memphis has been established 300 miles below. The effect of the nomenclature of cities and towns on American literature was briefly discussed by Mr. Field. He said he hoped that in the cultivation of a taste for letters and the arts, the subject of nomenclature would not be lost sight of, but that the American homes would be made all the sweeter by the association of pleasant names with pleasant places.

The Fuel of the Future.

PETROLEUM is to all appearances, says the London (Eng.) *Spectator*, destined to effect changes in commerce and industry, second only to those wrought by steam itself. Petroleum waste is already being extensively used for fuel on Russian railways; the steamships on the Caspian use nothing else. It is said that crude petroleum, after a few days' exposure to the air, may be used for the same purpose with perfect safety, and petroleum fuel can be delivered at Batum at twenty-six shillings a ton. If the scheme for running pipes from Baku to Batum be carried out, it can be laid down for very much less. But weight for weight, petroleum goes nearly three times as far as coal, and coal being worth at Batum from £2 to £3

a ton, it follows that 26*s.* worth of the liquid is equal to from £4 to £9 worth of the solid fuel. The extinction of our coal trade with Russia has become a question of a few months. Nor is this all. Petroleum goes into far less bulk than solid fuel, and can be handled at far less cost. If it could be used by ocean-going steamers for long voyages, the gain would be enormous. By storing the oil in the ballast tanks, the space now occupied by coal could be utilized for cargo; and as the fires are fed automatically—the petroleum being pulverized by a jet of superheated steam—the cost of stoking would be reduced to almost nothing. And this is no mere dream, but a present reality. "So simple is the fuel to use, and so reliable is the action of the pulverizer," writes Mr. Marvin, "that the English and Russian engineers, running the steamers from Baku to the mouth of the Volga, told me that, having turned on and adjusted the flame at starting, they concern themselves no more about the fires until they reach their destination in a couple of days' time." Petroleum is, moreover, clean to use, and makes no smoke.

Another and highly valuable peculiarity of petroleum is its existence in places remote from coal-measures, and where coal for steam or any other purpose is simply unattainable. There are large deposits of it in Beluchistan, the Punjab, and probably in other parts of India. It ought also to be found in the West Indies, in the Soufrière District of St. Vincent, the pitch-lake region of Trinidad, and on the northern coast of Venezuela. Enterprising capitalists in want of outlets for their money could not well embark in a more promising adventure than a quest for petroleum springs. The new fuel is not likely to supersede coal in England; but the struggle for existence and the lowness of freights may compel its adoption by all steamers which make long voyages. The resulting economy in our rapidly lessening coal measures, though it might not be viewed with satisfaction by the owners of collieries, would be an advantage to the community, and indefinitely postpone that dearth of fuel with which our industrial supremacy has so long been threatened.

Flagging Trains.

Mr. H. G. Burt, superintendent of the Iowa Division of the Chicago and Northwestern Railway, has issued the following notice, which he orders posted in all engines and caboose cars:—

To Conductors, Brakemen, and Engineers.

Referring again to the all-important matter of properly protecting trains which from any cause are detained on main track outside of station limits.

There are three things of vital moment in every such case; they are as follows:—

First. Flagmen must be sent out immediately in both directions.

Second. They must be sure to go fully prepared and go far enough.

Third. They must use every signal necessary to make a sure thing, if possible, of either being seen or heard, or both, by engineer of approaching train.

In regard to the first requirement: In stormy weather, unless the rear brakeman is an experienced and trustworthy man, the conductor should send the rear brakeman ahead with word to head brakeman and engineer to protect head end of train, and go back himself with signals in rear. In such cases the engineer will be held responsible for flagman being sent out ahead properly equipped.

As to the second: When men go out to flag, they should go out as quickly as possible and be sure to go far enough. In stormy weather, or on crooked track, or heavy grades, if possible, put at least a distance of twenty telegraph poles between yourself and your train. If you cannot count the poles, count at least one thousand good long running strides before you stop. Be sure to get far enough back.

Relating to the third requirement: When you get far enough back, use all the signals to the best advantage. Lose no time in placing torpedoes on rail; do not wait until called in. Employ every means at your command to make signals seen and heard by engineer of approaching train.

Think quickly, execute promptly and faithfully, and always keep your signals ready for immediate use.

Car Ventilation as a Right.

It is our opinion, says the *Journal of Railway Appliances*, that car ventilation must be absolutely uncontrollable by the passenger, and only partially so by the conductor, porter or brakeman. There is a certain minimum amount of air to which decent and self-respecting passengers are entitled, just as much as they are entitled to a certain degree of cleanliness; the line in the latter case being drawn several degrees on the clean and decent side of vomit and bugs; and in the case of ventilation, the limit mark certainly being fixable at some distance on the pleasant side of actual detestable funkiness, as determined by a decent conductor (who shall not eat onions nor drink rotgut whisky) after emerging from the fresh air, and *not* after the entire blunting of his sense of smell, caused by several hours' sojourn in a closed and unventilated car. We have been in sleeping-cars, the air in which had got so dead and rank that not a man in them could smell Limburger cheese; and we doubt very much if any of the passengers could tell the difference—or the snifference—between flat selters water and concentrated aqua ammonia. Under the existing custom of "ventilating," a clean-air loving passenger, evading the Scylla of nausea and headache, is confronted with the Charybdis of pleurisy.

We claim, and I think not without equity and reason, and perhaps not without law, that a company which would be compelled to keep solid ordure from the floors of its passenger cars, has no right to compel me to smell and breathe the putrefied quintessence and aroma of the same material. It is said to be a very hard thing to spoil a bad egg; but the problem is probably capable of solution, as much nastier matters are made progressively more and more offensive by being breathed in and out several hundred times.

Now we get back to our original idea which is that we have a *right* to that minimum amount of clean pure air which shall keep the average air in the car free from offensive smell. This amount should be provided for by means of many small openings, managed in the sides or roof, and absolutely uncloseable. The ventilated ceiling

that one finds in the clearstory roof of certain street-cars comes pretty near filling the bill. Made of perforated sheet metal, or of double veneer layers laid criss-cross, as in the well-known Gardner chair bottoms, they would be light, strong, sightly, and easily cleaned, and the time would come when "children would cry for them." With such an arrangement, the most sensitive lungs need fear no congestion, even in the coldest Winter, from drafts; and in fact, such ventilating ceilings would enable tender and delicate travelers to pass from the heated car to the open-air in Winter, with much less risk than at present.

As to how to get in the extra amount of air to which the clear-thinking passenger has no inalienable right. but is only entitled to by the grace of the conductor and the sufferance of his fellow travelers—that is another thing, and may be ciphered out at leisure by architects, hygienists, car-builders, and the public generally.

We have denounced an outrage, claimed the right to exemption therefrom, and pointed out the way to put down the one and secure the other.

Now bring on your schemes for admitting and keeping out the "supplementary but desirable" amount of clean pure air.

A Novel Railway Station.

A NOVEL idea has been adopted in building a new railway station at West Medford, Mass. Its walls are composed of rough stones, with trimmings of Freestone. Every child has been invited to contribute stone for the work, and a good-natured rivalry has arisen among the young people of the village in bringing singular and beautiful specimens. At one point a brilliant bit of malachite makes a spot of beautiful color on the wall; crystals of quartz, tourmaline, and even of rarer minerals abound; while the different sides of the building vie with each other in the richness and beauty of their stones. Several singular naturally eccentric shapes of stone are included, as well as fragments of rock from famous localities; and while much of the material is effective rather upon close examination than at a distance, the general result is not novel alone, but exceedingly good.

What the Railways Do.

TO-DAY the railways are moving more than 15,000,000 tons of farm products from the Far West to markets in the Eastern States. At 20 cents per 100 pounds, or $4 a ton from Chicago to New York, the cost is $60,000,000. At 65 cents per 100 pounds, the rate in January, 1860, or $13 a ton, the cost of moving the same freight would have been $195,000,000. By the development of the railway system $135,000,000 yearly have been presented to the producers of the West and the consumers of the East, to be divided between them. That is about $10 a year for every inhabitant of the great wheat growing States.

The Telegraph.

THE telegraph appears to have made more progress in the United States than in any other country. The number of American telegraph offices in 1882 was 12,917, and the number of telegrams forwarded during the year was 04,581,177. The number of telegraph offices in Great Britain and Ireland in 1882 was 5,747; the number of telegrams forwarded being 32,965,029. Germany had 10,803 offices, the number of telegrams forwarded being 26,260,-124. France had 6,319 offices, the number of telegrams forwarded being 26,260,124. Russia had 2,819 offices, the number of telegrams forwarded being 9,800,201. Belgium had 835 offices, the number of telegrams forwarded being 4,066,843. Spain had 647 offices, the number of telegrams forwarded being 2,830,186. British India had 1,025 offices, the number of telegrams forwarded being 2,032,603. Switzerland had 1,160 offices; Italy, 2,590, and Austria, 2,696. The number of telegrams forwarded in these three last mentioned countries was 3,046,182, 7,026,287 and 6,-626,203, respectively.

Building a Bridge over the Jordan, in Palestine.

U. S. CONSUL MERRILL, at Jerusalem, reports that during the past Summer an attempt has been made to build a bridge over the Jordan at Jericho. It has progressed slowly, however, as the lumber furnished had to be brought from Europe and carried on the backs of camels from the port of Jaffa to the river. The Consul suggests that there might be some market in Palestine for American lumber, as the Austrian and Turkish lumber now used there is of poor quality and high priced, but the country is probably too poor to make much of a market for anything at present; the whole yearly imports at Jaffa, which is the Mediterranean seaport for Jerusalem, amount to only about $600,000.

THE Russian Minister of Railways has just given an order for 140 locomotives to the Kolomna Works and Maltseff Company, to be delivered during the ensuing year. The contract with the Maltseff Company, in the province of Nijni Novgorod, is for 40 locomotives, and for the works at Kolomna 100; the price being 31,000 roubles (£3,100) for the first half delivered in both cases, and £3,000 for the remainder. A further order is also promised to both firms.

AT a recent meeting of German iron-masters, one of them reported that the Chinese Ambassador at Berlin had lately given an audience to a representative of the German Iron and Steel Association, at which he said the construction of railways in China would soon be begun—news which greatly interested the German iron-masters, as they expect to be able to supply part, at least, of the rails which will be required.

THE Wabash road, which is making a specialty of its dining-car service, is building at its own shops several dining-cars. One has been placed on the main line. These cars cost only $7,000 apiece. The car is fifty-three feet long, has twenty windows on each side, has ten tables, with a seating capacity of forty persons, and has eight center and four side lamps.

A SPECIAL from Omaha, Neb., states that the Union Pacific and Central Pacific have coöperated to establish a fast freight system between Chicago and San Francisco via Omaha; 1,000 air-brake cars have been ordered and will be running by March 1st. Through transportation will be reduced to eight days.

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THE CLOSE OF A YEAR.

WITH the present issue closes the fifty-eighth volume of the AMERICAN RAILROAD JOURNAL. During the year past it has been the aim of the management to impart to it a dignity becoming its venerable age, and it is now firmly established as a railway magazine and review. A glance at the index for the year will show that since the change in policy commencing with the issue for June last, in all forty-two original contributions on subjects of contemporaneous railway interest have appeared in the columns of the JOURNAL, together with a liberal quantity of editorial, miscellaneous and selected matter. The Street-Railway Department has been steadily maintained for the benefit of street-railways, and no subject of general interest has escaped comment.

Commencing with Volume 59, while the same general features and style of contents will be continued, our efforts will be redoubled to increase the value and interest of the JOURNAL, for what we hope will be a larger number of readers. While the JOURNAL has been well sustained during the year past, and while its modification in the form of a magazine and review has met with encouragement in the shape of subscriptions, we are decidedly of the opinion that there is room for a still greater increase of readers, and we confidently rely upon the JOURNAL itself as the best advertisement of its merits. Its record during the year is one that we are prepared to stand by as an index of the future, and Volume 59 of the oldest railway publication in the world will commence under most encouraging auspices. To all we say as we have said before, that contributions upon subjects of interest appertaining to railways, will be always welcome, and upon acceptance and publication a generous remuneration may be expected. To our readers we will also say that with subscribers we can never be over-supplied.

THE GROWTH OF RAILWAY POWER.

THAT the railways of this country are a power, and an increasing power, is not to be questioned, nor is it a cause for either wonder or alarm. Aggregated wealth is always a power, and the immense amount of capital invested in railways and railway industries cannot fail to have an influence upon the prosperity of the nation. Granting the premises of the arguments employed by anti-monopolists, we go no further in their company, nor can we admit that power in the abstract is anything so very dreadful to contemplate. The conclusions reached, that because the railways have this power they must necessarily use it to the injury of the public, is certainly not borne out by the facts of the case, and is wholly illogical.

Railways are a necessity; they call for large invest-

ments by capitalists, and, in order to induce capitalists to participate in railway enterprises, a clear path must be open to profitable operation. So much is clear, and even the anti-monopolist will admit the truth of these propositions. Now any extraordinary powers that a railway may possess are given by the people themselves, and by the people they can be abrogated. There in strict truth can be no monopoly built up by the use of capital alone, and the railways are forcible examples of the futility of such attempts, unless the people choose to be monopolized, so to speak, and for certain considerations give certain exclusive rights to railway corporations.

Unfortunately, on more than one occasion, the people as represented by their chosen legislators, have yielded much of their future privileges for the enjoyment of present, but they have done so with their eyes open, and capital having been embarked in railway enterprise with the solemn guarantee of the legal authorities that they shall enjoy certain immunities and privileges, claims but fair treatment when it demands that the original compact shall remain unbroken. There are occasions when legislators may with propriety curtail certain railway privileges without departing from the spirit of the original agreement, but in ninety-nine cases out of one hundred, where the power of railways is contested in the courts and legislative halls, such abrogation is without a shadow of excuse, and is generally based upon erroneous motives.

In truth, as we have more than once remarked, the less our legislators have to meddle with railway questions the better. Their duties in this connection are clearly expressed, and law gives them certain powers over the corporations; but the railway question constantly lugged in by the ears, has a strong tendency toward an ultimate governmental and State management. If such a time should ever come, the anti-monopolist would have a chance to spread himself and grow hoarse with rage at the latest and most improved form of monopoly, for if there ever could be a greater monopoly than a government railway, we have yet to hear of it. Conceive of such an institution being employed for political purposes, with its thousands of employés, each a placeman from flagman to superintendent! Talk of the overshadowing growth of railway power, and then glance at the possible condition of things under the system toward which the efforts of the anti-monopolists are leading. The government is the greatest and worst monopoly a country can have, if it is ill conducted; the greatest and best when well conducted. To instance the greater injury caused by government monopoly than by corporate organizations, it is only necessary to go back to the few days succeeding the national election last Fall. The telegraphic election dispatches at that time were somewhat unreliable, and it was hinted that this unreliability was not wholly unintentional. So great was the unpopularity of these mendacious purveyors of news at that time, that unthinking persons demanded that the telegraphs be put in charge of the government, while thinking people thanked Heaven that at least the injury of a national monopolistic telegraph was spared us. It requires but little penetration to view the corruption following the operation of a strictly governmental telegraph, and to judge that if one or two or three men could keep sixty millions of their fellow-beings on the ragged edge of anxiety, the powers of the National government in that direction could be rendered infinitely more objectionable. The less a government has to do in such matters the better for every one concerned, and our government has gone into railway management about as far as practicable.

That a country such as ours, with its vast undeveloped tracts, is of necessity compelled to seek development, is inevitable, and in the award of land grants there is not the slightest impropriety. It is furthermore perfectly fair to reclaim former grants that have not been utilized within the specified time, though doubtless it is equally true that in many cases the railways are blameless for this seeming negligence. But when a country has gone as far as this, it is about time to stop. Thus far it has been negotiating a business transaction, but beyond all is speculation, and a government is the poorest speculator in the world—an old granny of whom even the dullest operator can get the better.

The growth of the railway power over which many worthy people are now anxiously exercised, is a bugbear that should frighten few. The greater the growth the greater our national prosperity, and the power of the country increases five-fold more rapidly. The so-called prophecies of future ills resulting from the overshadowing power of railways and kindred corporations are, as a rule, but a form of dismal lamentations—that the lamenters were not favored with a slight hold upon this mighty power, for it is most remarkable to observe the speed with which an anti-monopolist is "converted" upon the accession of wealth, and the possession of the power which wealth confers.

GENERAL MILEAGE TICKETS.

A PROPOSITION was recently presented to the Cincinnati Convention of General Passengers Agents by a number of merchants, urging the adoption of a system of universal mileage tickets, these tickets to be sold at the rate of $100 per 5,000 miles or thereabouts, and to be good for travel upon any railway in the country, the various roads to be reimbursed in proportion to the number of miles traveled over their lines, by means of a railway clearing house which would adjust the settlements at brief and stated intervals.

While there is much that may be objectionable in the proposed system, there is also much to commend, and we are surprised at the condemnation which it has received at the hands of many prominent railway publications. The project, as suggested, would certainly do away with much of the free-pass nuisance, and also with the slaughtered rates and "knock-down fares." Whether it would prove profitable to the railways is another question, and one that they themselves are to consider. Certainly there is little that is complicated in the system, and the clearances could be made with little or no trouble. It is not fair to accuse commercial travelers of a superabundance of check simply because they desire special and reduced rates, and the proposed system does not contemplate a very low rate of fares at best. It is simply designed to furnish tickets that shall be of universal utility, allowing the possessor a free choice in his use of them. We fail to see where the railways would be the losers by the adoption of the tickets, provided the rate be a fair one, and we are not surprised to hear that the system is to be given a trial. The form of ticket to be adopted is known as the THRALL ticket, covering 1,000 miles and costing $30, with a rebate of one cent per mile. It remains to be seen whether a uniform rate of two cents per mile, at which these tickets are sold after the rebate is considered, will afford sufficient profit, and also whether the system will become popular to an extent that will lead to its wide adoption, but these questions are those of expediency, and we presume the railways are fully competent to deal with them. There is no good and sufficient reason why travel should not be sold at wholesale, and no one can be blamed for an effort to reduce the cost of anything which he purchases in large quantities. It is simply a matter of practicability, and it is a matter that the railways and the merchants must settle for themselves. There does not seem to us any great amount of cheek in the petition, nor, on the other hand, would the railways be to blame if they refused to adopt the system.

Regarding the feasibility of the universal mileage ticket system, its adoption is at best experimental, but the experiment will be watched with interest. If it proves a success, its permanent adoption in one form or another is merely a question of time, and the immense relief it will afford to the traveling public will certainly render it popular. Doubtless the question of rates may require some time to settle, but there must be a rate at which the ticket could be sold to the satisfaction of both the railway and the passenger. The system will be put into practical experiment on the first of April, and its operation will be carefully scrutinized. Its success will probably be the signal for a general adoption, and if it redounds to the benefit of both the railways and the passengers, a good point will have been scored in the progress of traveling facilities. The more it is looked at the more favorable does it appear, and its extreme simplicity is a strong recommendation in its favor.

EDITORIAL NOTES.

THE Suakim-Berber Railway, it is supposed, will render British progress in the Soudan simply irresistible. Possibly it may, but it is doubtful if the MAHDI will allow the construction of the road to dishearten him and his adherents. All efforts to "smash" him hitherto have been unavailing, and it is within the bounds of possibility that he may organize a rival road. The MAHDI is a strict anti-monopolist.

* * *

AN English firm of car-builders have not allowed Yankee enterprise to get the better of them, and they are now building a "concert-car." This car is to be furnished with a piano, and the noise of the wheels is to be deadened to prevent a disturbance of the concord of sweet sounds. Americans may now take a hint from the prevailing mania, and construct a "skating-rink car." This bold step would again put the American eagle at the fore.

* * *

IT is highly probable that the lease of the New Jersey Central by the Reading road will undergo considerable modification, if it is not cancelled entirely. The Central people have not found the lease to be as happy an adjustment of their difficulties as was hoped, while there is a pardonable feeling of State pride existing in Jersey to which the abrogation of the lease would be an agreeable sop. New Jersey would then have one road bearing the Statal name.

* * *

THE past few years have demonstrated some singular facts in connection with railway management, and all preconceived ideas based upon reason and commonsense have been found erroneous. It is now regarded as a settled fact that railways can never be truly prosperous until they have passed into the hands of a receiver. That functionary appears to possess a marvelous generic vigor, and the more hopeless the bankruptcy of a road, the more energetic and enterprising is its management when under the control of the courts. No scheme appears too gigantic for a receiver to undertake.

* * *

WELL, the "ides of March" have come—and gone—and for the first time in twenty-four years the "outs" are in and the "ins" are out. President CLEVELAND has made a good start, and his political opponents are according him generous treatment. An era of good-will is before us, and the time seems to be approaching when

ensible men may think alike, irrespective of party. Two things are thus far evident in connection with the new administration: the country is not going to the devil as prophesied by narrow-minded partisans, nor will the government be brought to a stand-still by the universal removal of Republican officeholders. In fact, the Democratic atmosphere is a little frosty at present, and the good old Jacksonian shakes his head dubiously at these new-fangled notions of civil-service reform.

* * *

WITH one position under the government, the railways of the country have a direct interest, and in the cause of true reform it is to be hoped that the present Chief of the Bureau of Statistics will be retained. MR. NIMMO has been a most efficient and valuable public officer, and his Bureau has been conducted on admirable principles. Its title is a misnomer, for properly it is the Bureau of Trade and Commerce, and the vast amount of information collected by MR. NIMMO has proved of great value.

* * *

IT is interesting to learn that the managers of the Franklin Institute, who successfully conducted the International Electrical Exhibition last year, have perfected plans for another exhibition in the Fall, to be known as the "Novelties" Exhibition. It will be restricted to recent discoveries, inventions and improvements in arts and manufactures, and with such a general field a highly useful and instructive exhibit may be expected. The control of the exhibition by the venerable Franklin Institute is of itself a guarantee of success.

OUR thanks are due to Messrs. Cassell & Co., of 739 Broadway, New York, for a number of their recent publications. Among the periodicals issued by this well-known house, are *Cassell's Family Magazine* and *The Quiver*, the latter designed as a Sunday magazine as well as for general reading. These publications stand deservedly high and are conspicuous for the excellence of their contents, as well as for the artistic character of their illustrations. The illustrations of *The Quiver*, especially, are deserving of praise.

MR. E. B. IVATTS, Goods Manager of the Midland Great Western Railway of Ireland, has in press an interesting volume entitled, "Railway Management at Stations," describing technically the British system, and going exhaustively into details. It embraces the author's wide experience upon Canadian, Indian and Irish railways, and a large sale of the work is anticipated.

"A TREATISE Relative to the Testing of Water-Wheels and Machinery, with Various Other Matters Pertaining to Hydrodynamics," is the title of an interesting little volume by James Emerson, which has already reached its third edition. It is published by the author, who is connected with the Emerson Power Scale Co., of Lowell, Mass., is profusely illustrated, and contains many valuable statistics.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

INSURANCE OF STREET-RAILWAY PROPERTY.

AT the recent Convention of the Street-Railway Association of the State of New York, the subject was broached of the formation of a mutual fire insurance company for the insurance of street-railway property, and strong reasons were urged why the project should be carried out. The fire insurance companies have increased their rates for this class of insurance, in many cases over 100 per cent., and in some cases even more, so that the street-railway managers were convinced that they were paying exorbitant rates for their insurance.

Secretary RICHARDSON, not without considerable trouble, has obtained definite information on the subject, and the results of his investigation show facts that may well cause the street-railway companies to pause and consider whether they are obtaining a *quid pro quo* for the sums annually paid in the shape of premiums upon fire insurance policies. The summary of facts collated by MR. RICHARDSON, as Secretary of the American Street-Railway Association, shows the following:

Total valuation of street-railway property of 178 companies in the United States and Canada, including depots, cars, stables, horses, etc.	$22,416,332 13
Insured for	14,111,970 03
Percentage of insurance to value, 62.95 per cent.	
Amount of premiums paid in 1884	196,540 66
Total losses since operation of roads	1,163,807 33
Estimated total premiums paid since commencement of operation	3,498,331 24
Percentage of premiums paid back for losses, 33.27 per cent.	

As MR. RICHARDSON truly says, these facts speak for themselves. The moral hazard involved in the insurance of street-railway property may be practically rated at *nil*, the interests involved are vast, the character of the insured is of the highest standing, and yet the insurance companies are charging the street-railway companies rates over fifty per cent. higher than the history of street-railways warrants.

The original plans for the formation of a mutual street-railway insurance company have been modified, and the

project is now being undertaken by the Street-Railway Association of the State of New York, which being located in one State can better carry out the plan. The proposed company is to be limited to the insurance of street-railway property only, as it is the purpose of the organization to benefit the companies and not individuals. As an additional security to the mutual plan, the company is to have a capital stock of $500,000, and subscriptions to the stock will, probably, be permitted upon the basis of the amount of premiums paid on property insured in the company.

At a meeting of the executive committee of the Association held in Brooklyn on the 5th instant, it was decided to urge the passage of a law by the New York Legislature, authorizing such a company to be formed, and we have but little doubt that such a bill will pass. Possibly it may be for the interests of fire insurance companies to defeat the bill, but the interests of street-railway companies are certainly more akin to the interests of the people, and the truths presented in the collated facts given above unquestionably warrant the street-railway companies in seeking proper redress from the injustice done them in the insurance of their property.

It is possible that the project will meet with further modifications before it is successfully accomplished, but in some shape the street-railways of the country should take immediate steps to form an organization with the object of mutual insurance in view. While the Street-Railway Association of the State of New York has undertaken the task of organization, the proposed company is designed for the insurance of property of all street-railways on the continent, and its success means the saving of a considerable sum to all companies that will avail themselves of its privileges. That they will do so seems assured. We can hardly conceive of a street-railway company paying for insurance double what it is worth, when they can procure the same insurance from a company of the highest standing, at almost actual cost. The formation of the proposed company would be the first great fruit of the organization of street-railway associations, and we trust that before the next meeting of the American Association, the New York Association will successfully organize the company. The announcement of such an organization at the meeting of the American Association could not fail to be followed by hearty coöperation, and stimulated by the successful attempt to relieve the street-railways of the country from an unjust and burdensome item of expense, efforts would be made in other directions for mutual action and reform in the details of management.

We shall await the developments of the project with great interest, and chronicle the events in connection with it as they may occur. Under the auspices of the gentlemen who have undertaken the task of organization in behalf of the State Association, there seems little likelihood of failure, and their dictum that the proposed company is both a desideratum and a feasible accomplishment we are willing to take without question, and consider as final.

THE New York Commissioners have finally submitted a report, which awards the privilege of constructing a surface road on Broadway, to the Broadway Surface Railroad Company. It is folly to assume that this award has met with public favor, and it is more than possible that it may not be adopted. The difficulty appears to have been that from the beginning the question at issue was as to which organization should be awarded the privilege of constructing and operating the road, whereas the proper method of procedure would have been to ascertain if *any* surface road were desirable. Considering the narrowness of our main thoroughfare, its great and increasing traffic, and the fact that several stage-lines are in active operation upon it, we fail to see the pressing need of the contemplated road.

* * *

THE abolition of matting and straw upon the floors of the cars on the elevated and surface roads is claiming the attention of the public, and it is strenuously urged upon the ground of health and cleanliness. It certainly would seem as if the substitution of wooden matting or a lattice flooring would be a great improvement over the ordinary hemp matting, both from motives of economy and cleanliness, and as far as straw is concerned there is little to be said in its favor. It may be a warm covering for winter, but the smell of the stable is ever present, and it is an excellent receptacle for dirt, to say nothing of the facility it offers for the loss of money and other small articles that may be dropped by passengers. To those inventors whose genius is bent in the direction of inventing street-railway devices, it may be said that a satisfactory and inexpensive flooring for street-cars has yet to be produced.

* * *

WE have received the printed minutes of the Third Annual Meeting of the American Street-Railway Association, a handsome pamphlet of 212 pages, prefaced by a portrait of President HAZZARD, and containing a stenographic report of the proceedings, together with the full reports of the special committees. These latter have already appeared in the JOURNAL. We have also received a copy of the proceedings of the Third Annual Meeting of the Ohio State Tramway Association, on November 19th, together with the reports of the committees on various subjects of street-railway interest. These reports are carefully prepared and of value, and we shall publish them in ensuing issues.

CABLE ROAD CONSTRUCTION.

BY W. W. HANSCOM, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN the construction of cable railways the largest item of cost is the road-bed and tube, and leaving out the cost of rails, it varies greatly with different conditions of climate, weight of traffic, and construction of street pavements.

First, when large variations of temperature occur in the climate, additional provisions must be made to resist the action of frost in its tendency to close the slot of the tube by forcing the two sides together, and also in thrusting the rails out of their normal position in reference to the slot.

Second, the top of the tube must be of sufficient strength to support the weight of the heaviest traffic that will generally pass over it; and as the larger the tube is made the greater will be the strength of the frame required, so the cost will be largely increased. It is therefore desirable that the sectional area of the tube shall be of the least dimensions consistent with sufficient room for the passage of the grip and cable, and carrying sheaves for the cable.

Third, the cost of paving will vary from McAdam to block paving, with variations in the size and thickness of the same, and whether with or without a concrete foundation.

It will be seen that all these conditions must be considered in the construction of cable railways in order that strength to resist climatic influences, as well as street traffic, may be combined with economy. The accompanying form of construction can, in proportions, be accommodated to such conditions as may occur in the construction of cable roads, and yet is moderate in cost.

Fig. 1 is a form of construction adapted for paved streets where the traffic is heavy and a smooth surface of pavement is necessary, especially when much crossing or turning out is done. The frame is made of cast iron or steel, and the chains for the rails are cast solid with the frame, and so constructed that no fish-plates or bolts are required in fastening; the rails being pushed apart after being dropped into the chair and held in position by a wedge which is put down between them. The angle or Z irons which form the top of the tube and slot are riveted to the frames, and the whole skeleton is strongly tied together. The shell of the tube is made of boiler plate in short sections, bent to the desired shape, and extending from frame to frame. This wrought iron or boiler plate shell may be made just large enough for the passage of the grip and cable, and at such points as the carrying sheaves are located, may extend below the sheaves at those points only, or may be carried to this depth the entire length of the road, as circumstances may render most desirable. The outline of the lower part of the grip shown in both figures is of that form known as the "bottom grip" from its taking the cable into it from its bottom, and is distinguished from the "side grip," in which the cable passes into the jaws at the side.

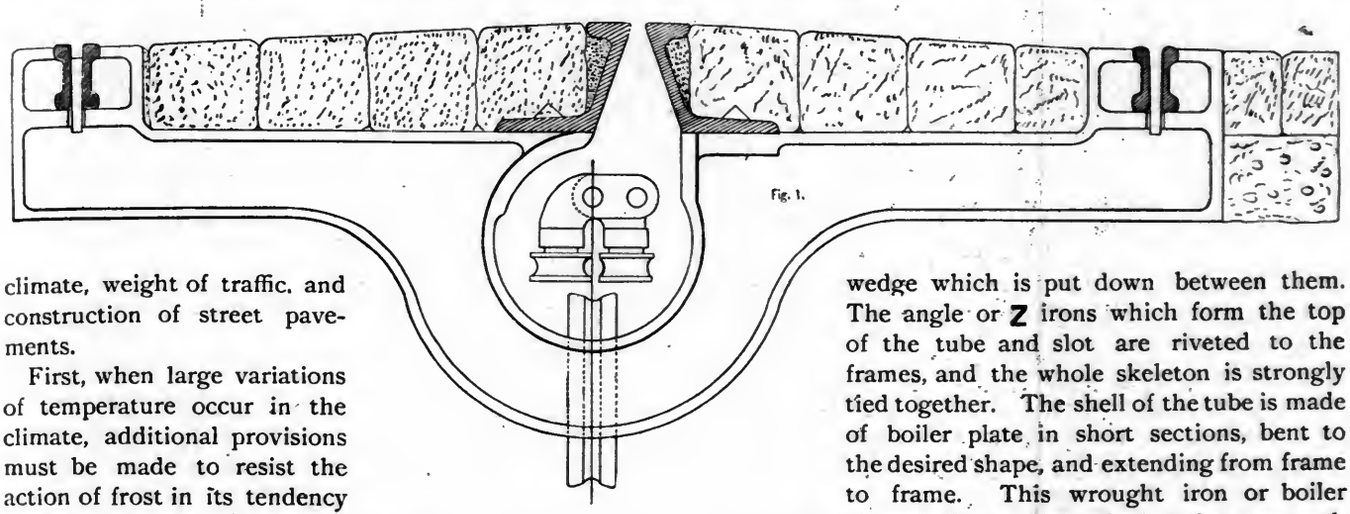


Fig. 1.

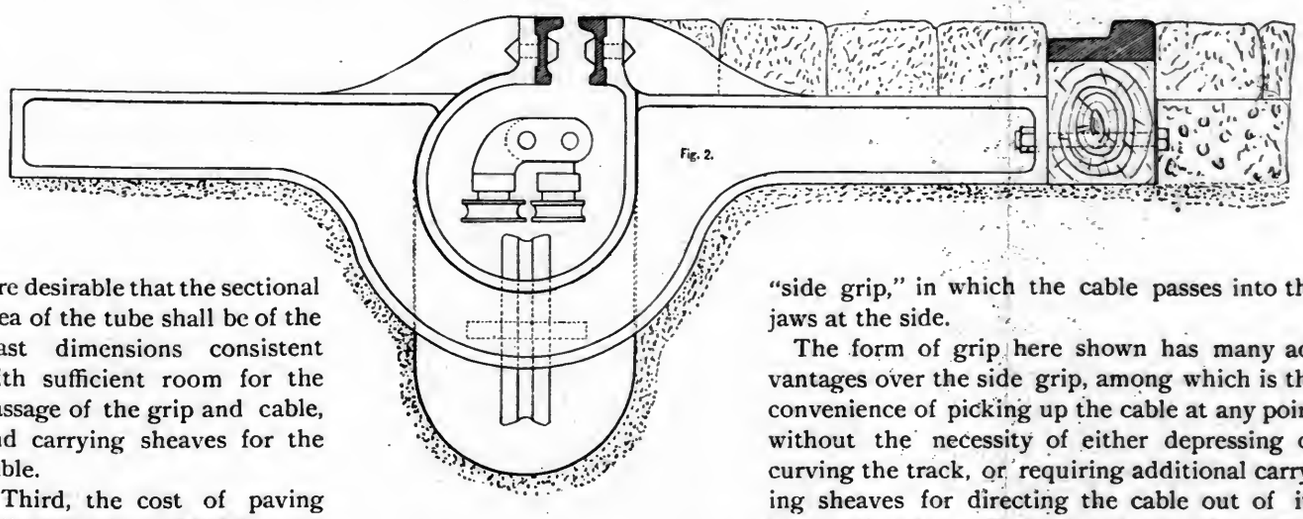


Fig. 2.

The form of grip here shown has many advantages over the side grip, among which is the convenience of picking up the cable at any point without the necessity of either depressing or curving the track, or requiring additional carrying sheaves for directing the cable out of its proper direction. By having the opening at the bottom, the cable is only required to be raised one inch instead of five to seven or eight inches, as in case of the side grip. Where curves of large radius are to be passed, vertical or side sheaves can be dispensed with by the use of this grip. The grip can be operated by screw or lever as may be desired. It will be noticed that the rails and angle irons forming the slot, are rigidly fastened to each other, so that their positions in relation to each other will be truly maintained by the frame.

In Fig. 2 the proportions and construction are some-

what changed to adapt the frame to a road where it is desired to use the rail in common use, or to convert a road already built to a cable road, and also to suit a lighter street traffic than that for which Fig. 1 is designed.

The rail as shown in Fig. 1 is so constructed that it may be taken up and reversed when worn, and having a groove in the center, any vehicle wheel may run along on top or cross it without difficulty, and may turn out from it without danger. This groove may be made of any desired width from one-quarter inch, or as thin as the flange of a wheel can be made and stand. This gives practically a uniform or smooth surface to the street, and overcomes the evils of the rail in common use, which is so destructive to vehicle wheels and so dangerous to life and limb when it is attempted to turn out at any speed.

In the construction of this form of tube, after the excavation is made, and the iron work put in position and lined up, the ground is filled in to within four or six inches of where the bottom of the pavement will be, and a layer of concrete from four to six inches thick is laid down all across the road bed, and on this the pavement is set; then nothing can go down or settle unless the whole width of street covered by the concrete goes with it.

ORIGIN OF THE WORD "TRAMWAY."

BY AUGUSTINE W. WRIGHT.

[A Paper read before the Western Society of Engineers.]

THE origin of the word "tramway" is exciting considerable interest at the present time, and our technical journals are devoting not a little space to this matter. In a recent communication to one of them, I stated my belief that the word was originally condensed from "Trammle." It has been, in my opinion, from ignorance attributed to "Outram," the name of an engineer, by dropping the first syllable of his name.

In the Engineers and Mechanics' Encyclopædia, by Hebert, 1838, under the head "Railway," it is stated: "The earliest account we have of the introduction of railways, is in the Life of the Lord Keeper North, from which it appears that about the year 1670 they were made use of at Newcastle-upon-Tyne for transporting coals from the mines to the shipping in the river. These railways were constructed of timber. It is stated by some authors that these wooden rails were subsequently improved upon by making ledges at their sides to prevent the wagons from going out of their tracks; a form that was subsequently given to them in cast-iron and termed *Tram-plates*. * * * The introduction of cast-iron plates having an upright ledge was originally effected by Mr. Carr at the Sheffield Colliery, about the year 1776."

Wood's "Practical Treatise on Railroads," was first published in 1825, and has ever since been considered unquestioned authority so far as he goes. He said: "Cast-iron rails, with an upright ledge for the purpose of keeping the wheels upon the line of the former, were first adopted about 1767. In the year 1800 we are told that Mr. Benjamin Outram, an engineer, in adopting this rail on the public railway at Little Eaton, in Derbyshire, first introduced stone props, instead of timber, for supporting the ends and joining of the rails. Mr. Outram, however, was not the first who made use of stone supports, as the late Mr. Barnes employed them in forming the first railroad which was laid down in the neighborhood of Newcastle-upon-Tyne, viz.: from Lawson Main Colliery to the river, in 1797."

So far you will notice that his cotemporaries give Mr. Outram no credit for any great prominence that would warrant the application of his name to the "tramways." His only improvement appears to have been the application of stone supports to take the place of timber, *and Mr. Barnes anticipated him in this idea by three years.* January, 1849, the *Civil Engineer's and Architect Journal* (page 6) contained the following communication: "SIR: In reading the article on George Stephenson, in the last number of the *Journal*, I noticed some errors connected with the description of the Stockton & Darlington Railway which I thought it would be well to point out to the writer of that paper, and to endeavor to correct them as far as I am able. Speaking of the Stockton and Darlington Railway, you say, 'This could hardly be named more than a tramway.' Now, from the very commencement, this line was a veritable railway. It could not properly be called either a tramway or wagon-way. In using those terms, we ought to be careful to apply them according to their proper and genuine signification, or serious errors may eventually creep into our descriptions of works of this class, and which may in course of time become perpetuated and the true meaning of the terms lost. Like railways, those three terms had their birth among the extensive collieries of Durham and Northumberland. The *tramways* are used principally *under ground* for the purpose of conveying the coals from the working district of the mine to the shaft up which they have to be drawn. In some of the extensive collieries, these tramways will extend for three or four miles. The gage of the road is about eighteen *inches*. The carriage which runs upon this way is a small four-wheeled rolly or tram (hence the term tramway.) Upon this carriage is placed the basket containing the coals. Previous to the introduction of tramways and trams, barrows were made for this purpose, the corf or basket being placed on the barrow, and a narrow flagged way for the barrows to run on was laid down, called the barrow-way, which term is even yet in some cases applied to the more modern tramway. It is, perhaps, 150 years since the barrow and barrow-way was superseded by the tram and tramway. * * * The *wagon-way* is used for conveying the coals from the pit to the ships, etc. * * * After wagon-ways, came railways. * * * From a long residence in the vicinity and particular acquaintance with the facts, I can vouch for the correctness of my statements." I regret that the above was signed by a *nom de plume* instead of the writer's name. His definitions are corroborated by Smeaton, who, in a report to Lady Irwin, January 27, 1779, on the "Measures of Coals at Newcastle and London," used the following: "And therefore, before the invention of the Newcastle rail or wagon roads, all the coals that were carried down to the ships must have been conveyed on horses' backs." And again: "Since the invention of coal wagon-roads."

The words Tram, Tramway or Railway do not appear in Samuel Johnson's Dictionary. Worcester states in the preface of his dictionary, 1846: "To the words now added to the vocabulary, and not found in Todd's Johnson, an asterisk has been annexed. Tram and Tram-road are so

indicated and defined, the former "A sort of four-wheeled carriage or wagon, a car," and the latter "A road prepared for the easy transit of trains or wagons, by placing on its surface smooth beams of timber, blocks of stone or plates or rails of iron, as wheel tracks. It is a kind of railway adapted for the passage of vehicles with wheels of the ordinary form, for the conveyance of wood, coals, stone, etc. It is also called Tram-way and Truck-way."

Gillespie, in "Roads and Railroads," in 1847, states: "Subsequently these wooden rails were covered with plates of iron; but the introduction of rails wholly of iron seems not to have taken place till 1767. A projection or flange on the outer side of the rails kept the wheels of carriages upon them. They were then called 'tramways.'"

D. K. Clarke in his "Tramways" says: "A tram, according to Nuttall, is the shaft of a cart or carriage. It is also the local name of a road-wagon, whence is derived the compound word '*tram-way*' or tram-road—a road laid with narrow tracks of wood, stone, or iron, for trams or wagons."

Knight in his Mechanical Dictionary states: "The name *tram-road* has been fancifully derived from Outram, but comes from tram, a beam, and the trams were the wagons which ran thereon."

Mr. Smiles in his "Life of Stephenson" has the following: "In 1800 Mr. Benjamin Outram, of Little Eaton, Derbyshire, used stone props instead of timber for supporting the ends and joining the rails. As this plan was generally adopted, the roads became known as "Outram roads" and subsequently, for brevity's sake, 'tramroads.'"

Encyclopædia Britannica, under Railroads, says: "The rapid wear of timber led to the structure of cast-iron to replace the wooden ones, and being limited in width, they were formed with a continuous flange or ledge on their inner edge to keep the wheels on the track. The roads were then called 'tram roads,' having been first laid down, it was said, by Outram, from whose name, omitting the first syllable, the word is said to have been derived. The derivation would apply equally well to the word trammel, the rail flanges being in reality trammels to gage the road and confine the wheels."

Skeat, in his Etymological Dictionary of the English Language, 1882, states: "Tram, a coal wagon, a carriage for passengers, running on iron rails. A tram is an old Northern word for coal wagon, especially such a one as ran upon rails. There was an act of Parliament for the year 1794 for the construction 'of an iron-tram-road, tram-road or railway' between Cardiff and Merthyr Tydvil. * * * About A. D. 1800, Mr. Benjamin Outram made certain improvements in connection with railways for common vehicles, which gave rise to the silly fiction (ever since industriously circulated) that tram road is short for Outram road, in ignorance of the fact that the accent alone is sufficient to show that Outram, if shortened to one syllable, must become 'Out' instead of 'ram' or 'tram'; beside which, Mr. Outram was not a coal wagon. Yet Brecket's Glossary, third edition, 1846, explains that a tram is the Northern word for 'a small carriage on four wheels, so distinguished from a sledge. It is used in coal mines to bring the coals from the hewers to the cranes.' The word is clearly the same as the Lowland Scotch. Tram (1) the shaft of a cart or carriage of any kind; (2) a beam or bar. This notion is borne out by the cognate Low G. Träam, a word particularly used for the handles of a wheelbarrow or the handles by which a kind of sledge was pushed. Bremm Wörberbach, edition 1771. J. H. Clarke notes that 'the amendinge of the highway or *tram* from the weste ende of Bridgegait in Barnard Castle,' occurs in a will dated 1555. Here a 'tram' probably means a log road."

I trust the foregoing statements will convince you that the so often-accepted derivation of this word "tramway" as derived from Outram is erroneous. You have seen that it was in use two hundred and forty-five years before he introduced the stone props, and I only wonder that the statement attributing the word to an abbreviation of his name has ever been allowed to stand unchallenged and uncontradicted.

The word "trammle," meaning "to confine, to intercept," as defined by Samuel Johnson in 1755, is a very old English word, and I supposed "tram" was derived from it by dropping the last syllable, as the wagons were confined to or intercepted by the tracks; but wheresoever or howsoever the word did originate, it was *not* from Outram.

An attempt has recently been made to induce the American public to use this word tramway in place of street railway, and I, for one, am glad that the American Street-Railway Association declined to adopt it. Street-railroads for passenger service originated in these United States, were known from their inception as "street-railroads," and the word tramway was not applied to them until their introduction into England by George Francis Train in 1860. By all means, therefore, let *us* continue the use of our own designation of street-railroad!

NEW YORK CITY STREET-CARS.

THE loud outcry made a few years ago against the old fashioned plush-covered spring cushions then used in street-cars for seats and backs, caused them to be removed and set car-builders at work to make a car that would be light, healthy and comfortable. The general plan of perforated wooden seats with plain backs has been adopted by all the companies. They are covered with a fine quality of heavy Axminster carpet during the Winter, and in the Summer nearly all the cars have only the wooden seats and backs. Open cars are used on a number of routes during the summer, and this is conducive to the health of passengers. The only particular difference in the furniture of the cars is in the mats used on the floor. Seven of the lines use sectional wooden mats of plain or ornamental design, while three retain cocoa mats. Wooden mats are the easiest to clean. Cocoa mats retain moisture on damp or rainy days and emit a musty odor. There are four sets for each car and they are changed every trip on rainy days.

The First and Second avenue routes, under one management, run 150 cars; the Third avenue, 180; the Fourth, 75; the Sixth, 88; the Broadway and Seventh, 135; the Eighth and Ninth, 160; and the Tenth, 120. At the stables of each the same general arrangement for cleaning cars is used, while the details only are different, being regulated by the judgment and experience of superintendents. From six to fifteen men are employed for cleaning cars by the different companies.

After every round trip that a car makes, it is taken to the stable, the mats are taken off the floor, and two men

with brooms and specially constructed brushes give it a thorough sweeping and brushing. After a car makes its last trip at night, it is run upon what is termed the wash-stand, which is a large turn-table surrounded by hydrants. Everything movable is taken out of it, and water is played from a hose on the inside and outside, while four men with scrubbing brushes and stiff brooms remove whatever dirt has accumulated during the day. After this operation the car is run upon a side track, and two men dry the inside and polish the windows.

While passengers find fault with the untidiness of street-cars, superintendents have a word also of complaint against passengers. If men would not convert a car into a spittoon for the reception of cigar stumps, tobacco-spit and quids, and a garbage-box for nut-shells, fruit-rinds, cores and pits, the remnants of lunches and old papers, it would be much easier to keep up a cleanly appearance. Section 167 of the Sanitary Code, which provides that no soiled article of clothing or bedding shall be carried on street-cars, except on the front platform, is strictly enforced by all the companies, and it is worth a conductor's position if he is proven derelict in this respect.

Nearly all the car companies build their own cars, and all have repair-shops at their stables, and as soon as a car is damaged by a collision it is sent at once to the shop and repaired. Men are detailed to keep a strict watch over all the working parts of cars.

No metal or plate has yet been found of which to make a hand-railing that will keep bright and untarnished. Many experiments have been tried, but the hardest plate that can be obtained will not stand the friction of the hands longer than two months, before the plated metal will show through. Cars are painted and varnished at least once a year. The various parts of the car last different periods. The wheels average about eighteen months on long routes; on short routes, about two years. Steps and platforms last about five years. There is no particular limit for the floors and framework, as they are but little worn. Cars are frequently built up from an old floor or framework, but at the end of about fifteen years there is little left of the original car.—*N. Y. Tribune.*

Fireless Engines on Street-Railways.

THE employment of fireless locomotives on street-railways has been tried on a very considerable scale in Batavia, according to the *Scientific American*, and has given so much satisfaction that it is contemplated to extend it. The Batavia Steam Tramway Company owns a line divided in two portions: the first, from Batavia to Kramat, having a length of 8 kilometers (5 miles) laid with a double track of Demerbe grooved rails, and the second from Kramat to Muster Cornelis, having a length of 4½ kilometers of single track of Vignolles rails. The first piece is almost level, with the exception of short inclines of one in thirty-two over bridges; there are two long curves and a number of short ones of 30 meters radius. The second section has a continuous gradient of 1 in 450. The haulage is effected by 21 fireless Lamm Francq locomotives and five stationary boilers, the whole of which were manufactured by the Hohenzollern Locomotive Works, Dusseldorf. Two of the boilers are situated at Batavia, and three at Kramat, but one only is in work at each station at a time, the remainder being in reserve.

They are worked twelve hours a day, and fill an engine every one and a half minutes during about three hours in the day, and every ten minutes at other times. An engine charged to a pressure of twelve atmospheres (180 lbs. per sq. inch) will draw two or three passenger-cars from Batavia to Kramat, and from Kramat to Cornelis, up and down again to Kramat. Part of the line was opened in July, 1883, and from the last annual report it appears that the cost of haulage amounted last year to twenty-three cents per kilometer (7.4*d.* per mile), composed of the following items:

	Cents.
Driving engines	4.7
Heating boilers	2.3
Coals	14.0
Packing, lubricating, etc	2.0
Total	23.0

(Five cents equal one penny).

More recently the cost of haulage has been only seventeen cents per kilometer (5.24*d.* per mile), the price of coal being £2 per ton. The consumption of fuel was at first 6 kilogrammes per kilometer (21.3 lbs. per mile), but recently it has fallen to two-thirds of that amount. Repairs of boilers and engines have cost two cents per kilometer, and have consisted chiefly in returning the wheel tires and renewing the felt on the boilers. Since the road has been completed, the receipts per month have amounted to 22,800 florins, and the total expenditure to 12,800 florins, leaving a net monthly profit of 10,000 florins (£800). The fare is 2½*d.* for a four mile run, or any part of it. The engines give every satisfaction. They are in native hands, and run constantly, with little attention and no break-downs. Two more have been ordered, and will shortly be shipped from Amsterdam. It is believed that with a better road the expenses might be reduced 50 per cent.

The Dublin United Tramways Company.

THE report of the Dublin (Ireland) United Tramways Company for the half-year ending December 31st, presents an excellent showing. At the meeting of the directors and the shareholders held on February 4th, the chairman of the board made the following statements: "During the half-year we carried 6,594,021 passengers, or an increase of 1,188,000, compared with the corresponding period of 1883. The penny fares realized £5,333, represented by 1,280,000 passengers, or an average of 7,000 per day. Notwithstanding that the cars ran 27,758 miles additional, the passengers increased from 4.66 to 6.10 per mile run. The average fare per passenger has been 2.10 pence, as against 2.39 pence, showing plainly that reduced fares and increased facilities to the public result in newly developed traffic and a steady improving revenue. The parcels delivery system still gains in public favor, as evidenced by the receipts, £327 representing the carriage of 29,380 parcels. The sum of £1,067 received by car advertising, is an increase of £158, and we hope to still further develop that much important source of revenue. The very satisfactory condition of the horses is evident to every one, and reflects credit on the management. During the past

half-year 107 horses were bought and 106 disposed of. On the 31st of December we had 1,008 horses, an increase of 32 on the corresponding half-year. The cost for forage was 10s 1½d per horse per week, or 3d per horse (£327) less than last year. The car-building goes steadily on, and the outlay under the head of repairs and renewals includes the cost of five new cars. Our tradesmen are now expert at car-building, and to provide for an increased production in every ensuing half-year, our workshops at Inchicore are being enlarged. The outlay of £4,307 on the permanent way, and charged to revenue, includes the sum of £1,994 for reconstructing a portion of the Kingsbridge line, with the improved steel girder rail. The new line through College Street, connecting Westland row with Dame Street, is finished, and will be opened for traffic as soon as it shall be examined by General Hutchinson, the board of trade inspector. Our last week's receipts show an increase of nearly £200, and we may now fairly look forward to a continuance of the support which the public are freely giving, and which the company, so far as good and cheap traveling can go, are doing their utmost to deserve."

Street-Railways at the Antwerp Exposition.

THE Antwerp Exposition will be especially interesting to street-railway managers on account of the very elaborate preparations in progress for the exhaustive trial of street-railway motors of any and all descriptions. This important subject will be under the fostering care of a special jury; and an interesting pamphlet by M. Dupuich, member of the 23d committee, gives detailed information on the subject. Those interested and desiring a copy of the pamphlet should address M. Dupuich, 42, Rue du Prince Royal, Brussels, Belgium.

A brief review of this pamphlet shows that the special exposition of street-railway appliances will be inaugurated May 3d, 1885, and continue until the close of the Exposition. A track will be laid three kilometers in length, with sharp curves (35 meters radii), on which will be instituted a regular horse-car service.

Every class of motor, automatic, electric, steam, etc., is welcomed, the condition being that the apparatus, be it comprised in one vehicle, or a dummy attached to a passenger-car, shall not exceed the length of the ordinary car with horses attached. The pamphlet gives minute details and specifications that cannot help being of great interest to street-railway managers.

An Improved Cable Railway.

A CABLE railway has recently been patented by Mr. Francis de Vooght, of Antwerp, Belgium. This invention covers means for retaining the cars on the rails on curves, and to hold them down to prevent tipping on steep gradients; means for conducting a cable through a shield or tube above or below the ground, and for avoiding friction; hooks of peculiar form for attaching and detaching cars; means for closing and unclosing the shield or tube to permit the car attachment to communicate with and be carried by the cable; means for passing other similar cables at crossings, and for adapting the same car to run either way on the same track, with provision for automatically disconnecting the hook from the cable and notifying the car-driver thereof at crossings, and other novel features, to facilitate the propelling of cars by endless ropes driven by stationary motors.

The St. Louis Cable Road.

THE St. Louis Cable & Western Railroad Company is to be completed by June 1. The Brownell & Wight Car Manufacturing Co., of St. Louis, were given the contract for twenty-four passenger-coaches of the most improved pattern, to be upholstered, and for fifteen grip-cars. Smith, Beggs & Ranken were given the contract for a 300 horse-power engine and for three boilers, each twenty feet long and sixty feet in diameter. The Fulton Iron Works, St. Louis, contracted for the winding machinery, pulleys, etc. The New Albany Rail Mill Company, of New Albany, Ind., took the contract for manufacturing the conduits. These will be of iron and steel; they will weigh altogether 1,900 tons, and will consist of eighteen-foot sections. The contract for the cable was secured by John A. Roebling's Sons & Co., Trenton, N. J. The cable will consist of 34,500 feet, in one piece, and will be of the best material. It is to be delivered at the cable company's power-house on May 1.

STREET-RAILWAY NOTES.

THE following officers of Massachusetts street-railway companies have been elected: Middlesex Horse-Railway Company—President, Charles E. Powers; clerk and treasurer, J. H. Studley, Jr.; superintendent, John H. Studley. Somerville Horse-Railway Company—President, Samuel E. Sewell; clerk and treasurer, J. H. Studley, Jr.

THE Chicago (Ill.) City Railway Company has elected the following officers: President and superintendent, C. B. Holmes; vice-president D. A. Jones; treasurer, Thos. C. Pennington; secretary, H. A. Windsor.

A NEW street-railway company is being formed in Cincinnati for the purpose of constructing a line of road from the center of the city to Mount Auburn, by way of Sycamore street hill.

THE Anniston (Ala.), Oxford & Oxanna Street-railway is approaching completion. Rails will soon be laid as far as Oxford and the road will then commence operations.

THE Macon (Ga.) Street-Railway Company invite proposals for 150 to 300 tons of iron or steel rails, to be delivered at Macon.

THE Tampa Street-Railway Company has recently been organized for the purpose of building a street-railway in Tampa, Fla.

THE College Street-Railway Company of Galesburg, Ill., has recently been incorporated with a capital stock of $40,000.

THE Union Street-Railway Company of Atlanta, Ga., has recently been incorporated, and will shortly build a road.

THE Brooklyn elevated railway is expected to be in operation by the end of May.

New Inventions.

McGrail's Piston and Valve-Rod.

JOSEPH MCGRAIL, of Savanna, Ill., is the inventor and patentee of an improvement in the construction of piston and valve-rods, the object of which is to save the time and labor required for repair or replacement of worn valve-stems and piston-rods, particularly the valve-stems of locomotive-engines. The usual method is to cut off the worn stem from the yoke and weld a new one on,

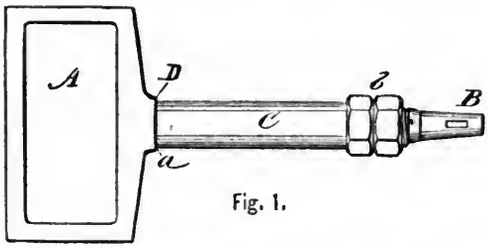


Fig. 1.

MC GRAIL'S PISTON AND VALVE-ROD.

which involves considerable expense for material and labor, besides the loss of old material and the necessity of keeping the engine idle for a day or two. The invention consists in the use of a sleeve on the stem which can be quickly fitted to an old stem or replaced when worn.

In the accompanying cuts Fig. 1 represents a plan view of a valve-yoke and stem of the improved construction, and Fig. 2 a longitudinal section of the same.

The yoke A, and stem B, are forged in one piece, as usual. Upon the stem is a sleeve C, seated so as to form a steam-tight joint in an annular recess *a*, formed in the shoulder D, between the stem and yoke, and held up to place by nuts *b*, which are threaded on the outer end

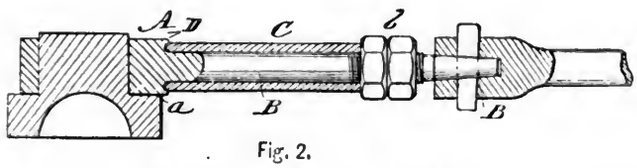


Fig. 2.

MC GRAIL'S PISTON AND VALVE-ROD.

of the stem; or equivalent means may be used in place of the nuts. The sleeve C, forms the wearing-surface of the stem, and will be preferably made of hard steel, so that this construction combines the strength of the wrought-iron stem with the hardened steel surface for wear, and consequently they will wear much longer.

In repairing a worn stem it is first turned down to gage the seat *a*, then cut and the sleeve put on. Thereby in a short space of time the rod is made better than new, and without putting the engine off regular work. The sleeve can be readily renewed when required, the seat in that case not needing to be re-cut. As a method simply of repairing worn valve-stems of locomotives this invention is claimed to be of great advantage, and it is evident that it can be applied to valve-stems and piston-rods generally, both in repairs and in the construction of new rods. The sleeve can be made steam-tight at the yoke without a recess, as shown.

Dingle & Jenkins' Improved Stuffing-Box.

WILLIAM DINGLE and William Jenkins, of Lake Mahopac, N. Y., have recently invented an improved stuffing-box, the construction and operation of which is shown in the accompanying cuts. It consists in a stuffing-box made in two parts with lugs perforated to receive the heads of the gland-fastening bolts, and a gland made in two parts with overlapping lugs to receive the fastening-bolts, so that the gland can be secured in the stuffing-box by exterior bolts and nuts, and can be readily applied and removed. The invention is described as applied to the heads of steam rock-drills, but it can be applied in other devices with equal advantage.

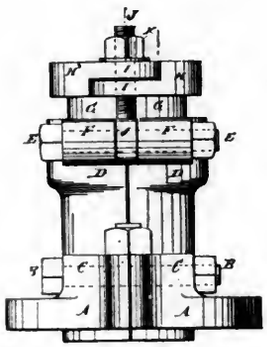


Fig. 1.

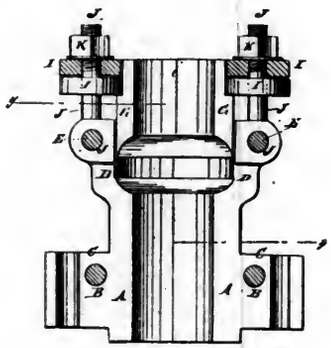


Fig. 2.

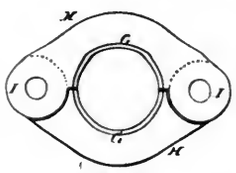


Fig. 3.

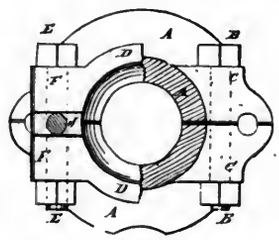


Fig. 4.



Fig. 5.

DINGLE & JENKINS' IMPROVED STUFFING-BOX.

Fig. 1 is an elevation of the improvement; Fig. 2 is a sectional side elevation of the same, taken through the line *x x*, in Fig. 1; Fig. 3 is a plan view of the gland; Fig. 4 is a sectional plan view of the stuffing-box, taken through the broken line *y y*, in Fig. 2, and Fig. 5 is a side elevation of one of the gland-fastening bolts.

A represents the head, which is made in two parts, secured to each other by bolts B, passing through lugs C, formed upon the head A. The parts of the stuffing-box D, which is formed upon the head A, are also secured to each other by bolts E, passing through lugs F, formed upon the outer side of the upper edge of the stuffing-box D. The inner surface of the sides of the stuffing-box D, is made smooth.

G is the gland, the outer surface of which is made smooth to fit the inner surface of the stuffing-box D. The gland G, is made in two parts, and with a rim or flange H, around its upper edge, the ends of the semicircular parts of which project and are halved to each other to form overlapping lugs I. The overlapped lugs I, are perforated to receive the bolts J, the heads of which fit into spaces formed by recessing the adjacent ends of the lugs F, these heads being so formed as to serve as parts of the lugs, as shown in Figs. 2 and 4. The heads of the bolts J, are perforated to receive the bolts E, by which the bolts J, are secured in place and held against the pull of their

nuts K, as the nuts are screwed down to draw the gland G, into the stuffing-box D, and compress the packing-rings, one or more of which can be used, as may be desired, but which are not shown in the cuts. When the stuffing-box D, is to be repacked, the nuts K, are unscrewed, the gland G, is lifted off the bolts J, and the bolts are turned down out of the way, leaving the mouth of the stuffing-box D, wholly unobstructed, so that the worn packing can be readily taken out and new packing inserted. With this construction there are no screw-threads upon the stuffing-box or gland, to become worn and thus loosen the gland and prevent it from holding the packing under the necessary compression, and should the threads of the bolts J, become worn, the worn bolts can be readily replaced with new ones at trifling expense.

The inventors have assigned their patent rights to Arthur F. Wendt, of New York City.

Nagle's Gearing for Force-Pumps.

AUGUSTUS F. NAGLE, of Chicago, Ill., has invented a new and improved gearing for force-pumps, the construction and operation of which is shown in the accompanying cuts. The gearing is designed for force or pressure pumps; and it consists, essentially, in the peculiar manner of connecting the plunger with the driving mechanism, whereby the lateral thrust upon the plunger is balanced at all points of the stroke. To accomplish this the upper end of the plunger is provided with a beam secured at right angles therewith, each end of the beam having a pin adapted to engage with a link or connection, which in

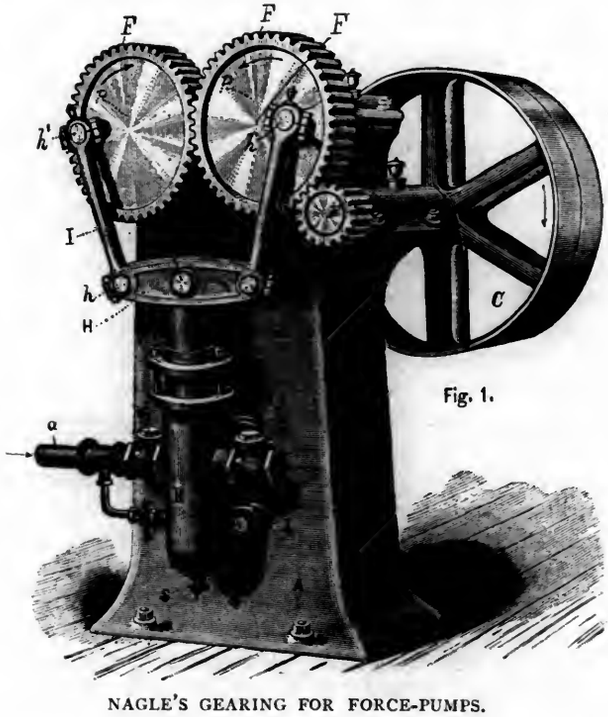


Fig. 1.

NAGLE'S GEARING FOR FORCE-PUMPS.

turn is connected with the crank-pin of a geared shaft. The object of the invention is to produce a pump having a balanced pressure or thrust exterior to the packing at all portions of the stroke, and at the same time being more efficient, combined with reduced cost, as compared with the commonly-used pumps having cross-head and guides.

Fig. 1 shows the gearing attached to a single-acting plunger-pump, and Fig. 2 a similar attachment to a double-acting pump.

A represents the frame or standard of the pump to which all the parts are secured, and *p'* is the bearing for the driving-shaft, the latter being provided with fast-and-loose pulleys C, and pinion E, as common, while *p p* represent bearings or boxes formed one on each side of the center, and at the top of the frame are gears secured to or mounted upon the shafts F', the gears being of equal size, meshing together, and adapted to receive rotary motion by means of the pulley and pinion. Crank-pins *h'*, are se-

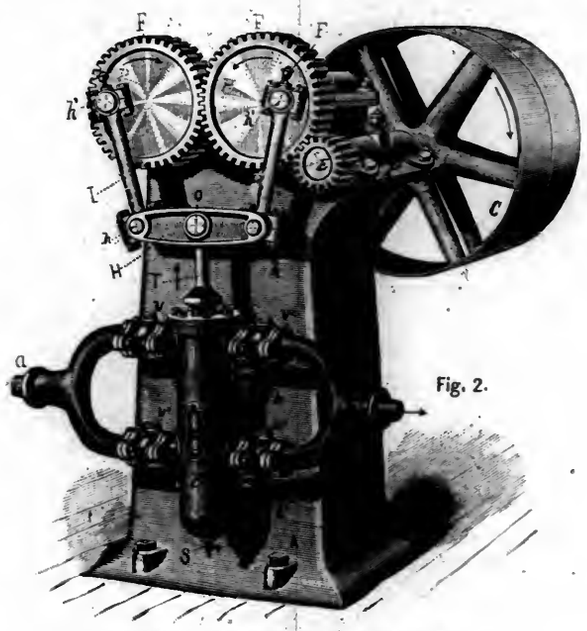


Fig. 2.

NAGLE'S GEARING FOR FORCE-PUMPS.

cured to the gears F, the location of the former corresponding to the stroke of the plunger. B is the pump-barrel, provided with inlet and outlet passages *a a'*, and check-valves *v v'*, as common. T represents the plunger working in the barrel. The upper end of the former is embraced by a beam H, the latter preferably being made in two parts and secured together by pins *o h h*, the length of the beam being represented as corresponding to the distance between the shafts F'. Links I, serve to connect the gears and plunger. It is evident that the revolution of the driving-shaft in the arrow direction imparts rotary motion to the shafts F', by means of the gears F F F, the latter in turn adapted to connect with the plunger by means of the links I, as shown. It is further apparent that by means of this improved device the thrust upon the plunger is balanced laterally at all points of the stroke, thus adapting the plunger to move in a true vertical direction, thereby resulting in increased efficiency and diminished cost.

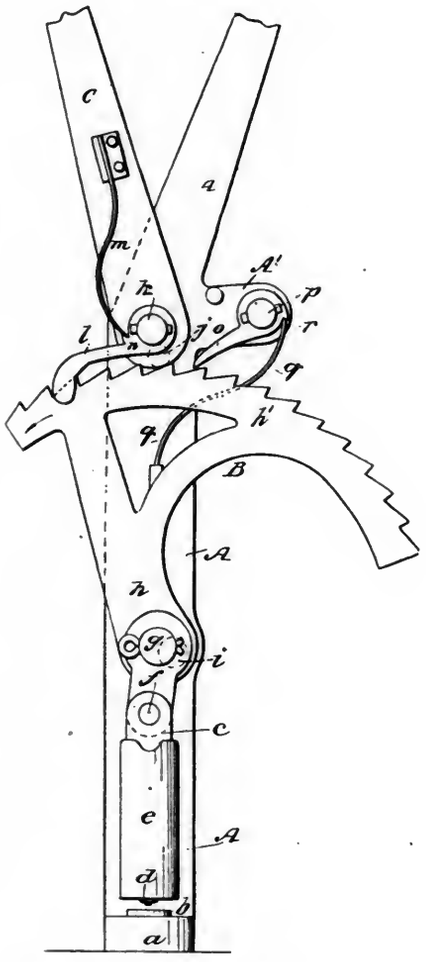
The device may be adapted for other uses than force-pumps, in which case the frame and plunger are preferably made integral.

McDonald's Metal-Punch.

GILBERT MCDONALD, of Augusta, Kans., has invented a new and improved metal-punch which is herewith illustrated and described. The invention has relation to a metal-working engine previously devised and patented by the same inventor, and it consists in the employment

of a segmental ratchet arranged to be operated by a pawl and lever for forcing downward the cutting or punching tool.

In the accompanying cut A represents the standard, formed with the base *a*, in or upon which the die-block *b*, is held. The thrust-bar *c*, in which the tool *d*, is held moves in a way formed by the cap-plate *e*, secured to the side of the standard A, so as to hold the thrust-bar *c*, immediately over the die-block *b*. The upper end of the thrust-bar *c*, is connected by the link *f*, to the stud *g*, formed upon the shank *h*, of the segmental ratchet B, which is pivoted to the standard A, upon the pivot *i*, which stands slightly out of center with the stud *g*, so that when the segmental ratchet B, is rocked upon its pivot *i*, the stud *g*, will have an eccentric action for raising and lowering the thrust-bar *c*, in substantially the same manner as described in



MC DONALD'S METAL PUNCH.

the patent above referred to. Just above the curved toothed portion *h'*, of the segmental ratchet B, is pivoted upon the stud *j*, the hand-lever C, and to the lever is pivoted upon the stud *k*, the pawl *l*, arranged to engage with the teeth of the segmental ratchet B, so that by reciprocating the hand-lever C, the pawl *l*, will work forward the segmental ratchet B, with great force, and cause the stud *g*, and link *f*, to force the thrust-bar *c*, and tool *d*, downward with great force, causing the tool *d*, to cut or punch the work placed upon the die-block *b*. The pawl *l*, is held in contact with the teeth of the segmental ratchet B, by the action of the spring *m*, attached to the hand-lever and arranged to press against the notch *n*, made in the upper side of the pawl. *o* is a stop-pawl for holding the segmental ratchet B, from backward movement. This pawl *o*, is pivoted upon the stud P, formed upon the extension A', of the standard A, and is held in contact with the teeth of the ratchet B, by the spring *q*, attached to the standard A, and arranged to act against the notch *r*, made in the heel of the pawl *o*, as shown clearly in the cut.

Constructed in the manner described, with a small outlay of power at the hand-lever C, the segmental rack B, will be forced forward with a slow movement and the thrust-bar *c*, downward with a force sufficient to cut or punch bars or plates of iron or steel.

Instead of using the pawl-lever C, for operating the segmental ratchet B, the teeth of the ratchet might be made like cogs, and a pinion and crank-wheel employed for operating it.

The inventor has assigned his patent-rights to Hartford M. Meredith, of Silver City, New Mexico, and to James A. Lucas, of Georgetown, New Mexico.

Werth's Spark-Arrester.

JAMES R. WERTH, Superintendent of the Brighthope Railway Co., of Richmond, Va., is the inventor and patentee of a spark-arrester for locomotives, which is herewith illustrated and described. Fig. 1 represents a vertical section of the smoke-stack, in part, with the portion of the invention that pertains thereto applied; and Fig. 2 an under view of the deflector.

G (Fig. 1) is the smoke-stack, mounted with the usual head or cap, G'. Within this cap G', at or near its top, is a hood or deflector H, arranged immediately over a funnel I, on the top of a spark-return tube J, and constructed to turn the sparks received up within it from outside of the funnel toward its center and down into the funnel I. Connecting this deflector H, with the lower end portion of the head or cap G', and in continuation, or nearly so, with the smoke-stack G, is an upright cylindrical netting K, within the head or cap G'. The under side of the deflector H, has an annular groove *b* in it (Fig. 2), to receive the upper end of the netting K, and has its interior cup-like deflecting surface divided by any number of thin radial partitions *c*, cast solid with it, and the upper end of the funnel I, is provided with lateral projections, which enter within cut-away portions of the inner lip of the groove, opposite or over any number of stud-bolts *d*, which serve to support and carry the deflector with its entered netting and the funnel, the studs passing from the smoke-stack up to and through the deflector, and being provided with eccentric collars *e*, to bind on bands, which pinch or hold the netting. These studs are much the same as are used in holding cones in diamond stacks.

The object of placing the netting K, vertical is to deflect the sparks into the deflector H, and thence into the funnel I. From the funnel I, the deflected sparks may be conveyed by the pipe J, into a spark-chamber L, on the forward part of the engine, and thence by pipes not shown in Fig. 1, within or outside of the fire-box, or to the combustion-chamber, or the sparks collected within the chamber L, may be otherwise removed, or they may be conveyed by the pipe J, either into the smoke-com-

bustion chamber or into the fire-box, which latter would be the case where no intermediate combustion-chamber is used, the pipe J, which may be a simple boiler-tube, passing along within the boiler; or the sparks may be conveyed by an outside pipe to the fire-box. The movement or passage of the sparks may be accelerated through

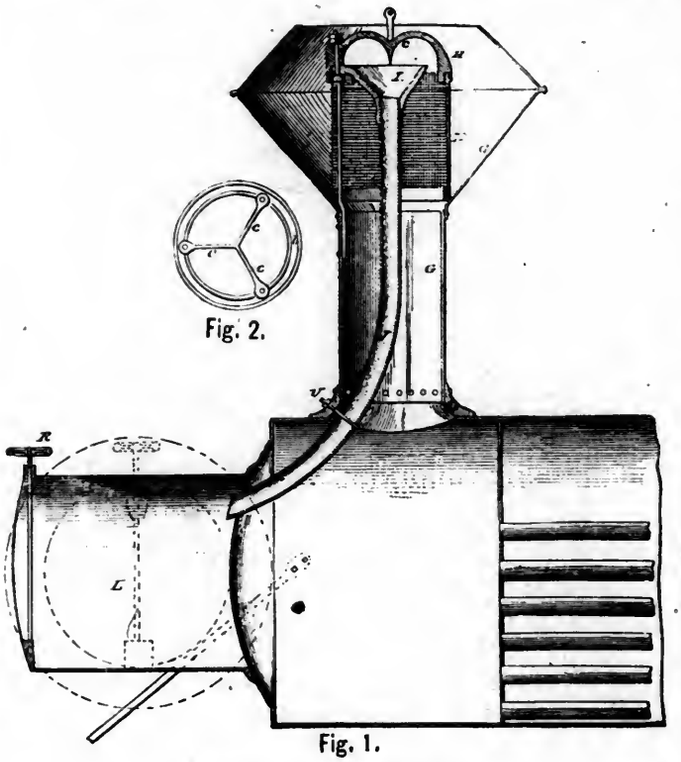


Fig. 2.

Fig. 1.

WERTH'S SPARK-ARRESTER.

the pipe J, by air or steam jets or jet-pipes that may be provided with regulating-valves under the control of the engineer, such jets generally, however, only being necessary when the pressure under the deflector and the partial vacuum in the fire-box are insufficient to secure the rapid return of the sparks.

From the foregoing description, it will be seen that no attempt is made to separate the smoke from the sparks until after the mingling of the same with the exhaust-steam, no separation taking place in the smoke-box. Furthermore, as the deflector H is above the netting K, and at the top or above the smoke-stack, no separation can take place below the netting and above the exhaust-nozzle; and as there are no deflectors or obstructions between the tube-sheet of the boiler and the netting, the full effect of the blast is utilized. Again, even still more dissimilar is the arrangement from those which provide for the escape of the exhaust-steam into the air without passing through a netting, and only mingles with such sparks as have escaped through the netting.

By this improved construction and arrangement of parts for catching the sparks, a finer netting than is ordinarily employed can be used—first, because a greater area of netting-surface is obtained by reason of the cylindrical shape of the netting, and, secondly, because the plane in which the netting lies is not at right angles to the blast, as is usually the case, but is vertical and parallel with the line of the blast; consequently the lodgment of sparks on the netting is next to impossible, inasmuch as the netting will be swept clean of all particles of unconsumed coal at or by each escape of the exhaust, and the particles being caught in the funnel, cannot subject the gauze to repeated abrasion, or, in case of the priming of the boiler, stop up the meshes of the netting. While, therefore, by the increased area of openings for the escape of smoke which the arrangement secures, a finer mesh may be used, if preferred, this is not absolutely necessary; as the direction of the blast and course of the flying cinders or particles, being parallel with the cylindrical netting, a coarser gauze may be used, inasmuch as the cinders or floating particles of burning fuel must be deflected from their course and strike the gauze at an oblique angle, which will insure the abrasion of the spark before escaping.

Medynski's Furnace-Grate.

FRED. V. MEDYNSKI, of Des Moines, Iowa, is the inventor of an improved furnace-grate, which is herewith illustrated and described. The object of the invention is to reduce the material weight and cost of a furnace-grate; to prevent it from being damaged by heat and fouled with adhering clinkers; to distribute air more uniformly to the fuel, and to burn the waste products of mines, known as "slack," as readily as graded and screen coal or lump coal. It consists in a cellulated wide and thin grate bar or section, having a reënforcing flange on its under side and feet or lugs at its corners.

In the accompanying cuts, Fig. 1 is a longitudinal section of the cellulated bar; Fig. 2 shows a complete bar in an inverted position; Fig. 3 is a transverse section, and

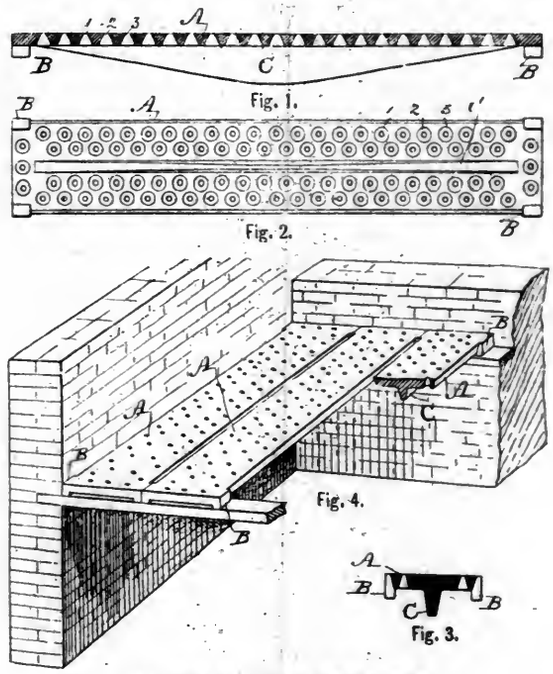


Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

MEDYNSKI'S FURNACE-GRATE.

Fig. 4 is a perspective view of a section of a furnace, showing the grate applied.

A represents the flat and perforated top surface of one of the grate-bars. It is preferably about six inches wide, regardless of the length of the bar. B represents a projection cast integral with each corner, that extends laterally about three-sixteenths of an inch and downward about half an inch, to maintain a slot in a complete grate between the contiguous edges of the bars, and also to keep

the ends elevated upon their supports, so that cold air can come in contact with the entire area and under side of the complete grate. The bar is preferably only about five-eighths of an inch thick and is reënforced by a tapering flange C, that is cast integral therewith, and about three-fourths of an inch thick at its top and about half as thick at its bottom, as clearly shown in Fig. 3. The numerals 1, 2, 3, 4 represent cellular openings in the entire under side of each bar or section of grate, that terminate in small perforations in the top surface. These conical or cup-shaped openings serve as air-cells, and gather and retain the cold air until it becomes heated and discharged upward into the fuel upon the top of the grate to promote combustion. The heat that is usually absorbed by the metal in a grate-bar is thus utilized in heating cold air in the cells on the under side of the grate, to facilitate combustion on top of the grate, and to prevent the forming of clinkers, soot, and smoke.

The inventor claims that by the application of his improved construction of furnace-grate, the grate-bars will be enveloped with air and prevented from absorbing and retaining heat, as required to burn fuel on their flat and smooth top surfaces without causing clinker to fuse with and adhere to the metal or to damage the bars by burning the metal.

Huber's Transverse-Pressure Railway-Brake.

LOUIS C. HUBER, of Huber, Ky., has recently invented a railway-brake, in which a semicircular brake-shoe engages the surface of a friction disk which surrounds the axle and is secured to it by set-screws; and it consists, essentially, in so constructing the actuating mechanism of the brake-shoe that it is forced against a disk secured to the axle and consequently revolving with it.

The device and its operation are fully shown in the accompanying cuts. Fig. 1 is a top or plan view of a car-truck embodying the invention, and Fig. 2 a side view of a car-wheel with the brake-shoe and disk attached.

A A represent the front wheels of a car-truck, connected with the usual axle, and A′ A′ the rear wheels of the same, similarly connected, while *a a* are friction disks sur-

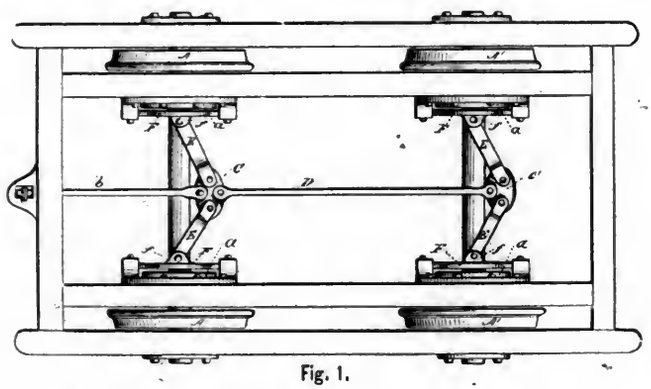


Fig. 1.

HUBER'S TRANSVERSE-PRESSURE RAILWAY-BRAKE.

rounding each axle and secured to them. D is a coupling rod, situated in the central longitudinal line of the truck, its front end being pivoted to the rear edge of the plate C, and its rear end being pivoted to the front edge of a similar plate C′, which stands as far behind the rear axle as the plate C, stands behind the front axle. E E are brake levers similarly pivoted at their inner ends to the plates C C′, and having their outer ends pivoted to the projections *f f*, of the brake-shoes F F.

The draught rod *b*, has its rear end pivoted to the plate C. The front end of the draught rod is connected with any of the powers now known to operate the ordinary brakes, viz.: The air cylinder; the hand power; by wheel and chain coupling, or by lever power. It is obvious that any power applied to the draught rod pulling

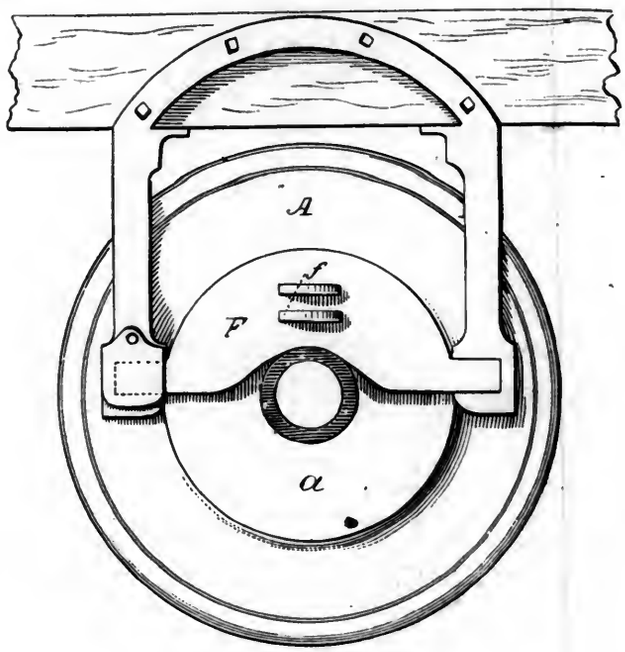


Fig. 2.

HUBER'S TRANSVERSE-PRESSURE RAILWAY-BRAKE.

longitudinally from rear to front, when the train is in motion, tends to force the brake-shoes F F F F, in a transverse direction against the revolving friction disks *a a a a*, thereby producing a powerful friction, and retarding the speed of the train.

It is claimed by the inventor that in the use of this brake, friction upon the car-wheels is entirely done away with, and that the brake-beams, hanging in front or in the rear of the wheels, and which are frequent causes of accidents, can be dispensed with. The brake is also self-adjusting, taking up its own wear, and its application is instantaneous. It is readily transferable and all of its parts are interchangeable, and of simple and strong construction, while it can readily be applied to all cars without structural change in the car-trucks.

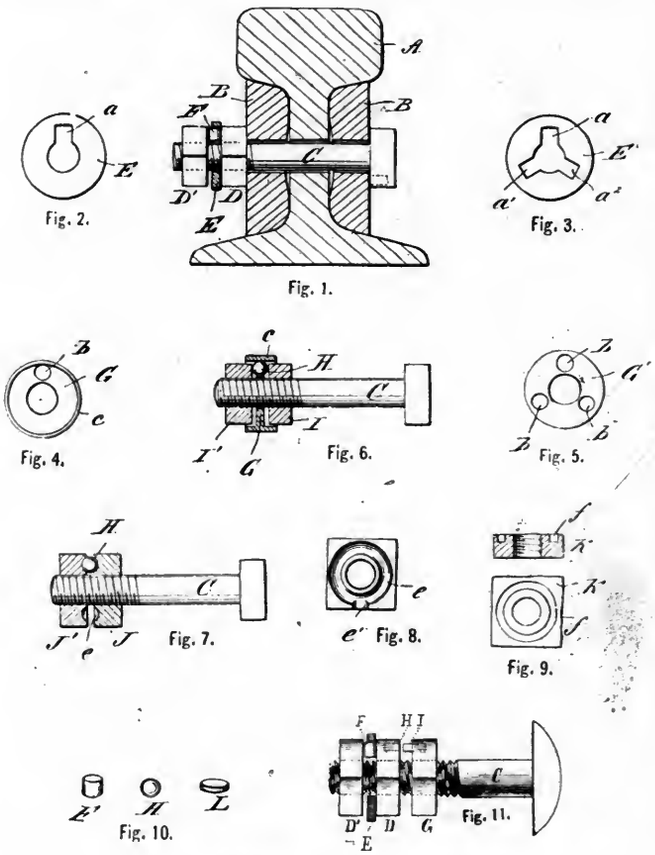
Campbell's Nut-Lock.

JAMES A. CAMPBELL, of Brenham, Texas, is the inventor and patentee of a nut-lock which is herewith illustrated and described. It consists of a friction-roller held loosely between two nuts, or between a nut and any object to be held by a bolt, which roller, when the nut or lock-nut is screwed down upon it, binds the nut or nuts upon the bolt and locks them securely thereon.

In the accompanying cuts Fig. 1 is a cross-sectional elevation of a railway-rail with fish-plates secured by a bolt-tightening nut and lock-nut, according to the invention; Figs. 2 and 3 are plan views of washers to be used

with a cylindrical friction-roller; Figs. 4 and 5 are plan views of washers to be used with spherical friction-rollers; Fig. 6 is a sectional view of two nuts locked upon a bolt, and showing a washer provided with an outside rim; Fig. 7 shows a modification in which a washer is dispensed with; Fig. 8 is a plan view of one of the nuts shown in Fig. 7, and showing a further modification; Fig. 9 is a plan and sectional view of a nut, showing another modification; Fig. 10 shows different forms of friction-rollers, and Fig. 11 is a modification of the nut-lock as shown in Fig. 1.

A is a railway-rail, B B the fish-plates and C one of the fastening-bolts, as ordinarily in use. Between the nut D, and the lock-nut D′, is placed upon the bolt C, a washer E, (shown in plan view in Fig. 2,) which washer is



CAMPBELL'S NUT-LOCK.

provided, adjoining the bolt-aperture, with a rectangular recess *a*, adapted to receive a short cylindrical roller F; which roller is of a slightly greater diameter than the thickness of the washer E. In Fig. 3 the washer E′, is provided with three rectangular recesses *a a′a²*. In Figs. 4 and 5 the washers G G′, are provided with circular apertures *b*, between the bolt-aperture and the periphery of the washer for receiving spherical rollers H. In Fig. 6 is shown a bolt having a tightening-nut I, and a lock-nut I′, between which is a washer G, having a circular aperture for a spherical roller H, which washer is provided with a rim *c*, covering the space between the nuts I I′. In Fig. 7 is shown a bolt having a tightening-nut J, and a locking-nut J′, which nuts are provided each with an annular semicircular groove *e*, for receiving and retaining the spherical roller H, and in Fig. 8 one of the nuts shown in Fig. 7 is shown provided with a short groove *e′*, extending from the groove *e*, to the edge of the nut. In Fig. 9 is shown a nut K, provided with an annular groove *f*, which groove is rectangular in cross-section, a pair of which nuts, when placed face to face, are adapted to receive the flat disk-like roller L, (shown in Fig. 10,) which disk may be made slightly convex upon one side and concave upon the other, to facilitate its movement in the grooves *f*. It is evident that, instead of using a tightening-nut with a lock-nut, one nut only may be used, with the roller between the nut and the object to be secured by the bolt and nut.

The washers shown in Figs. 3 and 5 are intended to be used between the fish-plate or object to be secured and the tightening-nut, so that their rollers will prevent the fish-plate or other object from turning the nut by any movement that it may have imparted to it—such, for instance, as the up-and-down movement of a fish-plate caused by a passing train. They may be used with advantage in connection with the locking-roller.

In Fig. 11 a modified form of the nut-lock is shown, with a nut G, and two pins H I, added, the nut G, being next the fish-plate and supplying the place of the three friction-rollers. By the intervention of this tightening nut G, the jarring of the fish-plate has no effect upon the nut D, to loosen it in any way.

It will be seen that in all the modifications of this nut-lock, one and the same principle is made use of—namely, a friction-roller held between a nut and the object to be secured, or between a tightening-nut and a locking-nut, whereby when the nut is screwed home to place, the nut is slightly canted by the roller and bound upon the threads of the bolt.

When a spherical or disk-like roller is used without a washer and with but one nut, the face of the fish-plate B, or other object to be secured in place, is to be grooved to correspond with the nut. The rim *c*, (shown in Fig. 6) covers the spaces between the nuts and the washer, and prevents dirt, etc., from settling therein.

With the nuts J J′, having the annular grooves *e*, a special tool may be needed to hold the roller between the nuts until caught by the grooves; but by providing the groove *e′*, (shown in Fig. 8) the nut J′, may be screwed nearly to place, and the roller then inserted through the groove *e′*.

This nut-lock is simple and sure in its operation, and is adapted for application upon bolts in any place where bolts are required, and can be varied in form as circumstances may require.

Howe's Rail-Fastening.

JOHN HOWE, of Newhall, Cal., has recently invented a new and improved rail-fastening, which is herewith illustrated and described. The object of the invention is to provide a simple, inexpensive, efficient, and durable fastening to secure railway-rails to the ties or sleepers of the track in a manner to prevent spreading of the rails or the splitting of the ties in laying the rails, and to protect the ties from cutting wear of the rails by the traffic over the road, and it consists in wear-plates interposed between the rails and the ties, and apertured to receive headed spikes and screws at opposite base-flanges of the rails, the heads of the spikes locking over the base-flange of the

rail at one side, and lips or shoulders on the spikes locking under the wear-plates on that side when the screws are turned home through their apertures in the wear-plates at the edge of the opposite base-flange of the rail as described.

In the accompanying cuts Fig. 1 is a longitudinal section of a railway-tie on the irregular line $x\,x$, Fig. 2, and a cross-section of the railway-rail, showing the improved rail-fastening applied, and Fig. 2 is a plan view with one of the inside screws in horizontal section taken just below its head. A indicates a railway-rail at the left-hand side of the track. B is one of the ties or sleepers. C is a metal wear-plate or chair interposed between the rail-base and the tie.

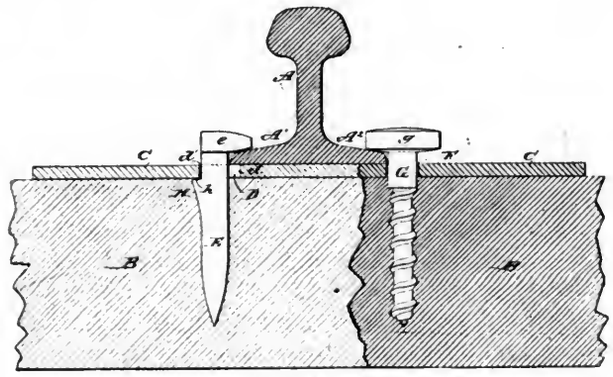


Fig. 1.

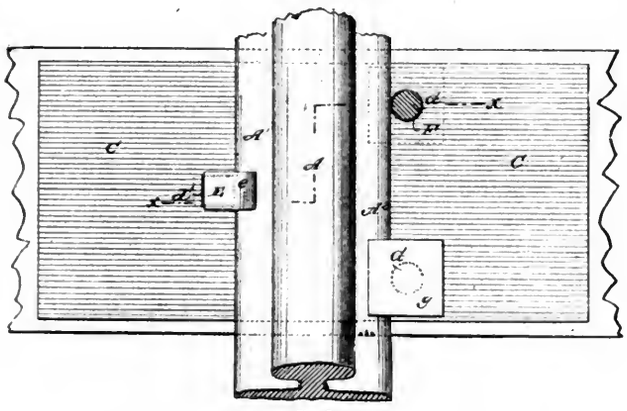


Fig. 2.

HOWE'S RAIL-FASTENING.

For ordinary railway tracks and traffic the preferred dimensions for the wear-plate C, are fourteen inches long, six to seven inches wide, and about three-eighths of an inch thick; but the size may vary with the degree of hardness of the tie, a hard-wood tie not requiring so large or thick a wear-plate.

Next to the outside flange A′, of the rail is punched a rectangular hole D, in the wear-plate C, and about at the transverse center of the plate and tie, and through which hole D, is driven the spike E, and next the opposite or inside flange A^2, of the rail is punched in the plate C, the two round holes F, through which to turn the screws G, down into the tie. The holes F, are formed one at either side of the longitudinal center of the wear-plate, so that the heads $e\,g$, of the spike and screws, respectively, take together a triangular hold on the base-flanges of the rail. The spike E, has a projecting lip H, at the back, with a square top or shoulder h, formed at a distance from the under side of the spike-head e, corresponding to the thickness of the rail-flange A′, and the wear-plate C, and the hole D, of the wear-plate is sufficiently long to permit the body of the spike E, with its lip H, to be driven through it into the tie.

In laying the rails they will be set on the ties B, and wear-plates C, and the plates C, will be set so that the inner ends d, of the spike-holes D, will lie about in line with the edge of the outside rail-flange A′. The spikes E, will now be driven home through the holes D, which will bring the spike-heads e, hard upon the rail-flange, and carry the shoulders h, of the spike-lips H, just below the lower faces of the wear-plates C. The wear-plates will now be driven inward along the faces of the ties until the outer ends d', of the slots D, come against the spikes E, above their shoulders h, which, while still locking the rails to the wear-plates and ties by the spikes, will also lock the spikes to place by the wear-plates, and will also carry the holes F F, of the wear-plates into line with the edges of the inside rail-flanges, A^2, so that the screws G, may be entered through holes F, and into the ties, and their heads g, be turned down upon the flanges A^2, to complete the fastening, as clearly shown in the drawings. A like fastening will be provided for the right-hand rail of the track.

By the use of this improvement the wear-plates not only protect the ties from being cut by the pressure of the rails, but serve also, aided by the weight of and on the rails, to lock the spikes down and prevent them from jarring loose and lifting out of place, and the spikes E, cannot be drawn without first removing the screws G. The edge of the outside flange A′, coming as it does against the side of the spike E, below its head e, and the screws G, giving such a firm downward hold on the inside flange A^2, it will be seen that a spreading of the rails, either by their outward movement bodily or by a tipping outward of the heads of the rails, is quite fully guarded against and prevented. In using a single outside spike at the center of the ties, and the inside screws G, near the side edges of the ties, the ties will not be split in laying the rails.

With this improved rail-fastening fewer ties may be used, and those used will last longer, which will compensate largely if not wholly for the expense of the wear-plates, and the labor of driving down the spikes on the base-flanges of the rails set directly on soft-wood ties when the rails sink into the ties is entirely avoided.

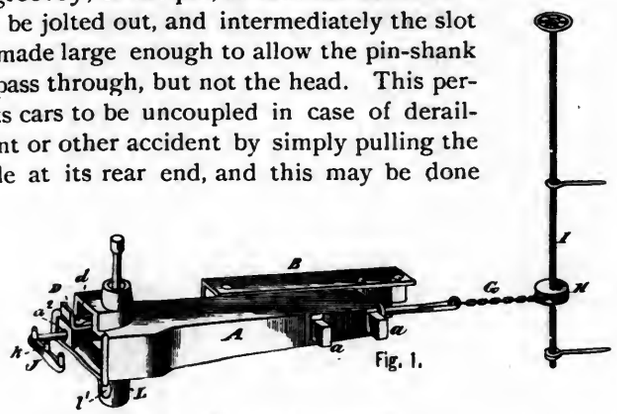
Edgar's Car-Coupling.

DENNIS P. EDGAR, of Jackson, Mich., is the inventor of an improved car-coupler, the construction and operation of which are shown in the accompanying cuts.

Fig. 1 of the cuts is a perspective view showing a draw-head with lateral studs near the rear end, a front link-support laterally pivoted, and a pin-support extending through both ends, the latter being connected with operative mechanism. Fig. 2 is a longitudinal section with a view of the relative position of the parts when the car is not coupled to another. Fig. 3 is a horizontal view, partly in section, to show the inside of the boxes and the position of the rubbers which take the shock. Fig. 4 is a side elevation partly broken away to show a modified con-

struction. Fig. 5 is a perspective view of the modification.

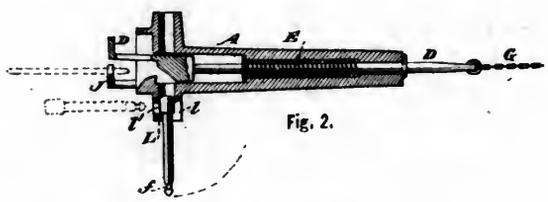
A represents a draw-head having the side studs *a*, which work in holes *b b*, of the boxes B B, and carry rubbers C C, which serve to take the shock in both directions, while the draft-strain is taken by the solid metal. D is the pin-support slide, which is held forward by a spring E, so as to sustain the pin until moved back by the coming together of two cars. The slot *d*, is made large enough in front to let the pin-head through it, and at the rear so small as to allow the side walls of slot to work in groove *f*, of the pin, so that the latter cannot be jolted out, and intermediately the slot is made large enough to allow the pin-shank to pass through, but not the head. This permits cars to be uncoupled in case of derailment or other accident by simply pulling the slide at its rear end, and this may be done

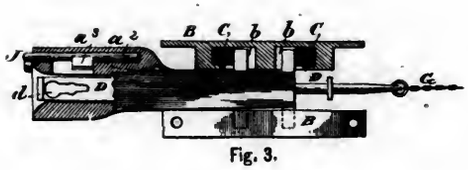

Fig. 1.

EDGAR'S CAR-COUPLING.

from the top or platform without the passage of the brakeman between the cars. In order to provide for the rear movement of the slide, its rear end is connected by a chain G, with a pulley H, made fast upon a shaft or rod I.

L represents a trap having a vertical hole large enough for the passage of the pin-head, a bottom slot *l*, open at one end, and a horizontal opening *l'*, as shown in Fig. 2. This enables the pin to be retained in a safe place until it is wished to couple the car to another,


Fig. 2.


Fig. 3.

EDGAR'S CAR-COUPLING.

when the pin is turned into a horizontal position and withdrawn from the trap. J represents an angular link-support with one pivoted arm arranged to slide in a hole a^2, of the draw-head, a stop a^3, being arranged on the link-support to prevent it from being drawn out altogether. The side arm of the link-support rests upon a flat spring K, as shown in Fig. 4, and is held up when the link is to be sustained, but at other times is allowed to hang down at the side. This link-support is adapted to draw-heads of varying heights. On the upper edge of the link-supporting arm is erected a median vertical stud *k*, and preferably, but not necessarily, one at each side, so that the middle one will pass up into the slot of the link, while one of the others will stand on each side of it. This in-

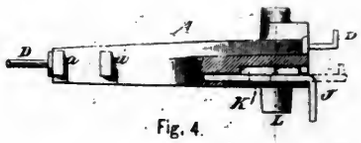

Fig. 4.

Fig. 5.

EDGAR'S CAR-COUPLING.

sures the link against lateral displacement. A crooked link may be used, if desired.

It will be perceived that with this invention the coupling and uncoupling may be performed without slacking the speed of the engine and the uncoupling from the top or inside of the cars, while at the same time it may be used with the old link-and-pin system.

A MASS meeting of inventors will be held at Columbus, Ohio, on the 22d day of April, 1885, for the purpose of perfecting an organization for the protection of inventors, manufacturing and developing inventions, detecting and prosecuting infringements, and instituting a benevolent brotherhood. All are cordially invited. For particulars, address, with a two-cent stamp, J. E. Woolverton, President and Chief Manager, No. 160 Vine street, Cincinnati, Ohio.

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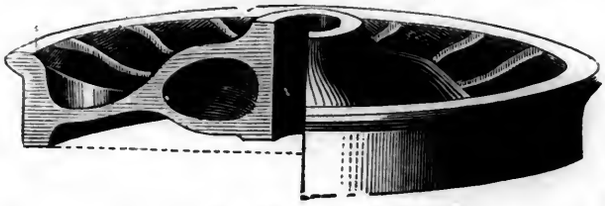
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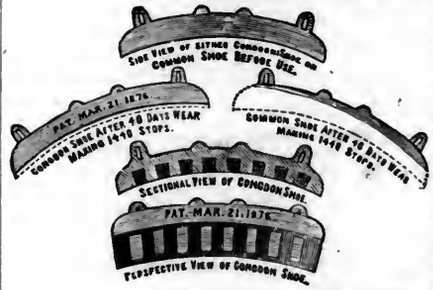
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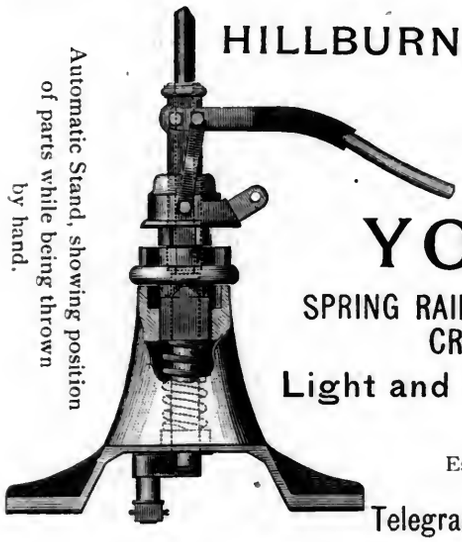
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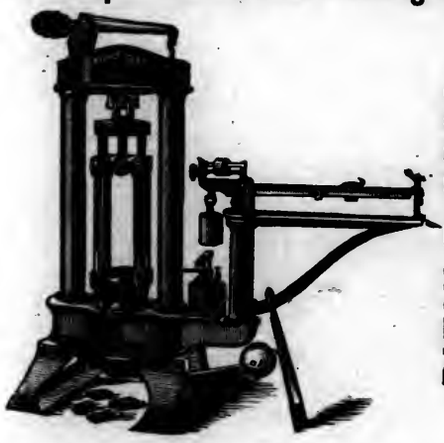
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